TELEPHONY

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Pay Rolls and Depreciation

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"WE ARE going to attack obsolescence." That, it is reported, is the attitude of the government towards the revival of the durable-goods industries. The administration knows, no doubt better than anyone else, that recovery cannot be attained in this country until employment has been restored in the so-called "heavy goods" industries of the nation.

There is, of course, no better way to put people back to work in the durable-goods industries than to do just what the government is reported to have in mind; that is, to "attack obsolescence." If the government can and will encourage, and in a practical manner help, industrial users to install modern, efficient plant and equipment in the place of that now worn and obsolete, employment will be restored in the heavy-goods industries and the users and owners of the new machinery will profit through its greater efficiency.

This applies as well to the telephone industry as it does to any other. Thousands of telephone exchanges, unable to carry out through the depression the rehabilitation work they would ordinarily have done, are in need of new plant, equipment and buildings. Now that many of them are regaining subscribers, their need for rehabilitation is becoming more acute. They need to "attack obsolescence," and they are anxious and willing to do their full part in the great efforts of the government to speed recovery.

Unfortunately the government seems to be working—at least so far as the telephone industry is concerned—at cross purposes. Undoubtedly the government wants the telephone kept modern; certainly the patrons do. Undoubtedly the government wants employment restored in all industries that develop, process and manufacture things used in the telephone business.

CONTINUED development of the art of telephony, and increased employment in manufacture and processing of telephone equipment and material, depend on the rate of depreciation allowed telephone companies

But government seems right now to be going down a road that can take away from the industry its ability to keep modern and to restore employment to normal levels in businesses processing material and in factories manufacturing equipment for telephone companies.

The Federal Communications Commission is undertaking (as it is required by law to do as soon as practicable) to determine and fix rates of depreciation that may be charged to operating expenses by companies under its jurisdiction, on telephone property the commission considers depreciable. Various state commissions are undertaking to do the same thing. These inquiries have so far applied only to Class A telephone companies, but it must be assumed that they will later be extended to the smaller companies.

In most, if not practically all, cases where such depreciation rates have already been determined by state commissions through actual hearings (none have so far been fixed by the FCC) the composite depreciation rate allowed the telephone company has been lower than the rate the company has felt to be necessary to perpetuate its property.

It can be assumed that the tendency of commissions will be to allow a lower rate of depreciation than the company has either been charging to its operating expenses, or feels that it should charge if its earnings allowed, to operating expense. It can also be assumed that the tendency of commissions will be to reduce rates for telephone service as a result of the reduction of depreciation rates.

This is said in no spirit of criticism of commissions or of any form of governmental regulation of the telephone industry.

As to the latter, accredited spokesmen for the industry have for years reiterated, in legislative hearings and publicly in other ways, that telephone companies are not opposed to regulation. In fact, commission regulation has been in many ways a highly constructive factor in the development of telephony.

As to the former, it is only natural

that when a commission passes upon a proposition that is—as will be pointed out hereafter—by its very nature a shot in the dark, the commission must use the utmost of caution in its decision.

The situation discussed herein does not arise from the desire of any commission, state or national, to create an issue so impossible of clear determination. It has arisen from a combination of circumstances; it has been aggravated by economic conditions beyond any control, and its seriousness is intensified by the uncertainties of the future.

Its possible result upon the telephone industry, and upon employment created directly and indirectly by that industry, and upon the general prosperity of the country insofar as it is affected thereby, is worthy of the thoughtful consideration of everyone concerned.

The telephone business is admittedly one major industry in this country that has always kept abreast of the times. Ever since its inception, only a little more than 50 years ago, the history of the business has been one of constant change, improvement, development and progress.

The telephone of today is, of course, nothing like that of 50 years ago; what is more important, it is not like that of 20 or even 10 years ago. One outstanding feature of the telephone industry is that it has discarded almost as fast as it has built.

There is probably no other important industry of modern times—unless it be some certain branches of the automotive industry—that has, on the whole, as ruthlessly and as quickly thrown out the obsolete when it became obsolete and substituted for it the modern and efficient; that has passed on to the user improvements and betterments in service as rapidly as human ingenuity and inventiveness, and painstaking development, produced them.

The whole telephone plant of the nation has been torn down and built over again, in the name of progress, a number of times in the comparatively short space of half a century, since the business was born. That is the reason the United States has the best and most comprehensive telephone service in the world today.

There has been one reason, and one only, why this was all possible: The public was willing to pay the price of progress!

It is well to remember that progress costs money, whether in the telephone business or in any other. Progress is achieved only through the constant destruction of property. Every improvement of something now existing renders something now existing obsolete. If progress is to be had, somebody must pay its cost.

As to the telephone business, the proposition resolves itself in finality down to one question: Does the public—the user of the telephone—prefer a telephone service that stands still from now on, so far as the progress and further development of it is concerned, or does it prefer to pay the cost of the continued development of the art?

Depreciation Includes Obsolescence and Inadequacy

It is well also to remember that upon the answer to that question there depends the employment or lack of employment of many people who have in normal times been engaged in the manufacture of improved telephone equipment to take the place of obsolete equipment, and in the processing and manufacture of plant material—poles, wire, cable, conduit and hundreds of other items in the telephone plant.

If plant and equipment is not to be replaced because it has become obsolete, but only because it has worn out, the need for workers in the manufacturing branch of the telephone industry will never again reach the relative normal of the past. It might be added that the telephone industry is in this regard merely a cross-section of industry at large in the United States; stop progress, and you reduce employment; foster progress, and employment will increase.

Ever since it has been realized by the industry itself and by the courts—as it was recognized later by regulatory commissions when they were established—that the cost of perpetuating the property is an integral part of the cost of producing service, the telephone industry at large has stood firmly for a rate of depreciation sufficiently high to cover not only wear but also the cost of the elements of obsolescence and inadequacy. The latter elements must be provided for if the art of telephony is to progress and the plant is to meet the needs and demands of the public served.

To provide for them, the rate allowed for depreciation and consequently the rate for service must be sufficiently high to create reserves against which plant retirements—and often large ones—can be charged as and when developments of the art require or allow the modernization of plant, or when the shifting of population or changes in public requirements necessitate plant alterations.

There seems to have arisen a belief that the depreciation reserve can be tied in some more or less definite way to what engineers call the "per cent condition" of the plant; that is, that if a plant is examined and found, say, around 90 per cent good, the depreciation reserve is sufficient if it is around 10 per cent.

This theory could apply only to a plant that is so new or so modern in all its parts and so exactly adequate to meet the then needs and requirements of its patrons, that the elements of obsolescence and inadequacy could not be present. Even then, this condition could last only momentarily, because the development of the art and the changes in the needs and demands of the public are going on night and day.

It goes without saying that very few telephone plants are ever in this happy condition. As to other plants, a depreciation reserve sufficiently high to meet, as and when they must be met, the costs of modernization and of plant alterations to meet changing public requirements, is a necessity if the industry is to progress.

Take away this reserve and destroy the ability of the telephone company to restore it, and progress in telephony will languish, simply because the telephone company will have neither the reserves nor the funds with which to replace obsolete plant and equipment with modern.

It will be unable to do that thing the government apparently recognizes as a requirement of all industry in order to restore prosperity to this country; it will be unable to "attack obsolescence."

Present Reserves Are Needed

Of course, there are some telephone companies with depreciation reserves now larger than they would ever seem to need for any practical purpose, just as there are a large number of companies that have never been able to build up an adequate reserve simply because their rates have never been high enough to properly provide for depreciation. Extremes will naturally be found in an industry containing as many units as the telephone business in this country; there are more than 6,000 separate telephone companies and more than 20,000 separate telephone plants in the United States.

But on the whole the industry has needed and has used or will need and use in due course in the process of repair, modernization and publicly required plant alterations, all the depreciation that has been charged in the past to its operating expenses, and all the present reserves resulting therefrom. It is these reserves, and

additions made to them, that stand between the industry and decadence.

The state commissions understand all this. In the past they have wisely allowed telephone companies, as a part of operating expenses, depreciation at a rate sufficient to encourage and allow developments in the art and modernization of plant. In doing this they have served the public far better than they could possibly have served it by reducing rates for telephone service and stopping the progress of the art.

Facts—No Guess

But this proposition of fixing in advance a rate of depreciation that is to apply for the future, puts the state commission "on the spot," to speak plainly, when it attempts to carry out the idea.

It is one thing to determine and fix a fair and adequate rate of depreciation for a telephone plant at the same time the rates for the service rendered by that plant are fixed; it is something else again to stand responsible for an estimate of future depreciation, based on premises that must by the very nature of the case be highly theoretical, and upon which will depend the future progress or lack of progress of the telephone industry and, consequently, the grade and comprehensiveness of the telephone service that will be rendered the public in the future.

When rates are fixed by commissions, they are based on conditions of fact then existing and that can be determined and judged at the time with reasonable accuracy. The then rate of earnings of the telephone company is a known fact; the number of its subscribers and its prospects of growth are easily ascertainable.

The condition of its plant is determinable at the time; not merely its "per cent condition," but also the degree to which it is modern and, therefore, able to render service of present-day caliber; likewise the extent to which it is adequate to meet the then-existing needs and demands of the patrons to be served. The amount of its then reserve for depreciation is a known fact.

With all the foregoing and the other knowledge of that particular company and plant then available, and available as of that particular time, there can be determined with reasonable accuracy and with fairness the rate for service that will at that time provide the telephone company a proper return on the fair value of its property, and the amount of depreciation that should properly be allowed as operating expenses of the company to enable it, under its own then existing conditions, to meet its costs of wear, obsolescence and inadequacy. And, when all this has been done, it has been done on the basis of existing facts, and not on speculation as to the future.

Consider what the commission is up against, however, when it undertakes, without regard to rates for service or to the company's earnings or to then-existing or to future economic conditions, to fix in advance a rate of depreciation to fit the future. No one knows, and no one will ever know, what amount is necessary for any given telephone company to provide in the future the reserves it must have to meet wear, obsolescence and inadequacy.

There is no yard-stick by which the future costs of obsolescence and inadequacy can be measured. It might be possible to land, by the use of estimates based on the past, within at least striking distance of the cost of wear of telephone property, but who can foretell the rate and the extent of future development of the art? Or who can foretell the shifts of population or the changes in the needs and demands of the public served that create the element of inadequacy?

Obligation of FCC

The past is absolutely no measure of the future of these things. The development of the art may be only minor during the next decade, or—and this is more likely—it may be revolutionary; but who knows today which it will be? And, whichever it may be, who can tell, today, what it will cost any given telephone company to keep abreast of the changes?

If depreciation rates are fixed so low by commissions that the reserves built up therefrom are insufficient to allow obsolete plant and equipment to be discarded as improvements in the art become available, then telephone development will be seriously retarded. That will not be because telephone companies do not want to modernize, but because they cannot; they will have neither the funds nor the reserves sufficient for the purpose.

The Federal Communications Commission, if it undertakes to fix a rate of depreciation for the future, applicable to companies under its jurisdiction, has in this respect a most serious obligation to the public served by the telephone companies.

Upon the policy of the Federal Communications Commission as to depreciation will depend the ability or the lack of ability of a large and important section of the telephone industry to keep pace with the developments of the art. Upon that policy will also depend the employment or lack of employment of many people heretofore engaged in the development and manufacture of improved telephone equipment.

You Cannot Mass-Produce Telephone Service

The public served by the telephone companies subject to the federal commission will receive a constantly-improving telephone service or it will not—depending on the commission's policy with respect to depreciation.

The obligation is a grave and serious one; upon it will depend to a large extent the question of whether the telephone industry is to be made decadent by federal control, or is to continue to push forward in the future, as vigorously as it has in the past, toward continuously improving and more comprehensive service.

There appears to be some outside thinking concerning the telephone business which is to the effect that if telephone rates were lowered the number of telephone subscribers would vastly increase, and that the result of this would be that telephone companies would m a k e adequate earnings and many more people would have the benefits of the service.

Anyone who knows enough about the telephone business to really judge what it can or cannot do, knows the fallacy of this reasoning. You cannot mass-produce telephone service. Anyone who knows what happens to the cost of making telephone service when a plant grows from a non-multiple to a multiple switchboard or its

COMING CONVENTIONS

Minnesota Telephone Association, Hotel Lowry, St. Paul, January 29, 30 and 31.

Nebraska Telephone Association, Hotel Lincoln, Lincoln, February 13 and 14.

Iowa Independent Telephone Association, Hotel Fort Des Moines, Des Moines, February 26 and 27.

Wisconsin State Telephone Association, Park Hotel, Madison, March 5, 6 and 7.

Oklahoma Utilities Association, Hotel Biltmore, Oklahoma City, March 12 and 13.

Texas Telephone Association, Baker Hotel, Dallas, March 25, 26 and 27.

Kansas Telephone Association, Hotel Kansan, Topeka, April 10 and 11.

Ohio Independent Telephone Association, Hotel Deshler-Wallick, Columbus, May 1 and 2.

Indiana Telephone Association, Claypool Hotel, Indianapolis, May 8 and 9.

equivalent, knows that as the number of subscribers on a given exchange increases beyond certain points, the cost of serving each subscriber becomes much heavier.

Telephone service is personal service. People unacquainted with the telephone business often liken it to the light and power business. The principal and almost the only resemblance between the two is that they both use poles and wire.

Generally it makes no difference to the user of electric current how many other people are connected with the wires that serve him, but the difference between one subscriber and two subscribers on a telephone circuit is the difference between a private line and a party line—and a considerable difference in the value of and rate for the service.

All this is elementary to those who really know the telephone business, but many who do not know the business persist in the belief that a lower telephone rate is possible in the present state of the art.

Lower Rates Depend On Development

The fact is that a lower level of telephone rates is possible without bankrupting the industry, only if, as and when developments in the art of telephony make it possible to produce good telephone service at lower costs. For many years the industry has been trying to find out how to do this. It has not succeeded in this country, nor have the diligent and ingenious inventors of any of the other countries in which many telephone improvements have originated —such as Germany, England, Sweden, France—found out how to do it.

Any idea that any organization, here or abroad, may have discovered and have suppressed perfected methods of producing commercial telephone service at greatly lowered costs, is laughable. No telephone manufacturer of the world could afford to withhold an invention or improvement so valuable.

The fact is that the cost of making telephone service, like that of making anything else, will more likely be lowered, not by one single discovery or invention instantly applicable to the industry, but by the normal and gradual development of the art.

The rate at which this development will take place from now on in this country—which has, since the inception of the telephone, been always in the vanguard of telephone development—and the question of whether it will continue to take place in this country at all in substantial measure, depend largely upon the policy of government, national and state, regarding depreciation of telephone property.

It is necessary for recovery in our country that the durable-goods industries be revived. It is quite right to say that in order to do that we must "attack obsolescence." It has been always the custom of the telephone industry, until prevented temporarily by the depression, to attack obsolescence. That policy has built up and maintained a number of manufacturing institutions making and processing telephone apparatus and all the various parts and materials that go to make up the telephone plant, aggressively developing the art and giving employment to many people.

Those institutions and that employment cannot be maintained, even in prosperous times, on anything like a normal basis if the policy of the telephone business is changed as a result of governmental regulation.

"You cannot have your cake and eat it too." The cost of progress must be paid. Because of the nature of the telephone business, the cost of progress in it has necessitated a rate for depreciation that would provide for obsolescence, and rates for service that would provide for that rate of depreciation.

It is a fallacy of utility regulation that the public prefers cheapness to quality or low rates to progress. It is a reasonable conclusion that if the users of the telephone in the United States knew these facts about the business and could in some practicable manner voice their opinion on the policy to be maintained, they would order continuation of the development of the art, and would willingly pay the price to make that possible.

PUPPETS

By MISS ANNE BARNES,
Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa

Puppet shows offer a few minutes' diversion; you are amused for a brief time, then you pass on and forget. You feel no sympathy for the puppets even though they get some mighty hard bumps. The show usually goes off well unless the string manipulator behind the scene has trouble with the proper movement of the strings. The cheers of approval by the audience are for the puppets rather than for the string manipulator back stage.

Puppet shows are more common than we realize. They are going on all about us in real life—*human* puppet shows. Some of the puppets enlist our sympathy; some amuse us; others do not get much of a rise of any kind out of us, because we are not interested even though they *are human* puppets. Very often our sympathies are misplaced. We feel sorry for the puppets when our sympathies should be with the ones who are backstage manipulating the ways and means to help the puppets put on the show. But here again, if all goes well, the cheers of approval go to the puppets; but whenever there is a hitch, the "cussing" goes to the string manipulator backstage.

I have in mind one of the finest men in the world who has to work long, weary hours to provide the wherewithal to keep the stage set to suit the tastes of an expensive family. He has made his own way in this world under many unfavorable conditions, but he is now a successful business man. He is determined that his children shall have every educational advantage he was denied, that it is possible for him to give them.

I doubt that they realize the sacrifices he is making to keep the show going. If he fails them in any little way, how they do grumble!

He is so busy backstage that he has little, if any, time to come out in front and enjoy the show he is responsible for. But, likely, he would not enjoy it anyway. He would neither understand nor care for the empty life they lead or their shallow "friends." He would feel out of place, and be out of place, and his family would side-swipe him whenever he got in their way. He would soon slip away to his own place backstage where he would feel at ease with about the only thing he has ever known—work. Work—to keep the show going.

MORAL: He who hopes to be successful in life must operate his own procedures.

The Operators' Corner

By MRS. MAYME WORKMAN
Traffic Supervisor, The Illinois Telephone Association, Springfield, Ill.

COOPERATION between toll center and tributary exchange is essential in order to render satisfactory toll service. Ways and means of improving service. Series No. 178

LAST week suggestions were offered to tributary operators for improving their customers' toll service. Additional suggestions are given as follows:

In some cases, the tributary subscriber, in placing a toll call, tells the operator he would like the time and charge, or merely the charge, on the call at the finish of conversation. The tributary operator, in passing the ticket to the toll center, should request the "T & C" or the "charge" when placing the call.

The toll center operator will make the necessary entry on the ticket and, at the first opportunity, will ascertain the rate to the called place, securing it from the rate operator, if it is not posted at her position. If she does not have a rate operator, she will look up the rate and enter it on the back of the ticket in the lower right-hand corner. After this action has been taken, the toll center operator will be ready to quote the rate at the finish of conversation.

If the tributary operator fails to let the toll center know that her customer has requested the time and charge or the charge on his call and it is necessary to secure this information later, in some cases a delay will be encountered, as the ticket may have been filed, or it may be in transit to the filing position. The reason for this delay in securing the time and charge or the charge is not understood by the tributary subscriber and has a tendency to make him become impatient.

In cases where the calling party fails to hold the line, after passing the ticket details to your toll center, add the word "released" to let the toll center know that the calling party is not holding the line and that it will be necessary to ask you to ring the calling number when she is ready on the call or when she is ready to give a report.

If you are locally instructed to pass to the long distance operator the number and name of the trunk you are using, pass this information first and wait for the long distance operator to answer a second time before passing the details of the call. Failure to follow this procedure, when you have been so instructed, will result in delay, as it will be necessary for the toll center to ask you for this information.

If long distance requests you to ring a number which you are holding or if she asks you to release a trunk and number which you are holding, acknowledge the request by saying "Right."

If long distance does not signal you on a cord on which you are holding the trunk and ask you to ring the number or to release the trunk and the line within 15 minutes from the time she ordered them held, reach her, ask her if she wishes to have the trunk and the line held longer, and proceed as directed.

If you receive a supervisory signal on a cord on which you are holding a line to complete a long distance call, cut in and answer, saying "Operator?" If the customer wishes to make a local call, say: "This line is being held to complete a long distance call." If he still wishes the local call, establish the connection. Then ring on the trunk on which you are holding long distance and tell her that the line has been released. If you receive a call over another trunk for a line which you are holding for long distance, give a busy report.

In ringing your toll center, ring a full two-second ring—no more, no less. After you have rung on a ringdown trunk to your toll center, the time allowance for holding the ringdown trunk waiting for an answer is 30 seconds, during which you repeat the ring at 10-second intervals. Do not ring on another trunk until the 30 seconds have elapsed.

Some operators have a habit of ringing on two or three circuits or ringdown trunks, if they are available, if they do not get an immediate answer on the first circuit or ringdown trunk used. This causes signals to appear on all of these circuits or trunks, which must be answered by the distant operator, resulting in delay and a waste of operator and circuit time.

As stated last week, we must have cooperation between the tributary and toll center office in order to render satisfactory toll service to tributary subscribers. All of the suggestions given will be helpful in attaining this end. Next week suggestions will be given to toll center operators for improving tributary subscribers' toll service.

Questions from Illinois Operators

1. How long should we wait on local before giving a "don't answer" report?
2. On local, do you use a split connection on calls originating at a pay station?
3. When you call for a room number in a hotel, is it a person-to-person call?
4. I am a tributary operator and I pass a toll call to my toll center on a call to Galesburg. At the end of conversation, must I clear the circuit to Galesburg or does my toll center do this without my help?
5. On a station-to-station call, would a switchboard operator be considered qualified to talk?

For the answers to these traffic questions from real Illinois telephone operators, please turn to page 26.

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New Telephone Cable to Be Laid in South Africa

A new telephone cable is to be laid between Johannesburg and Springs, in South Africa, which will necessitate the digging of a trench between Germiston and Springs, a distance of 12 miles. The total cost of the cable, which is being manufactured in England, is approximately $310,000.

The digging of the trench will afford employment to 200 European laborers for at least three months. The cable will link up all the East Rand towns between Johannesburg and Springs, and provide a greatly improved telephone service.

Measurements In Direct Current Circuits

By ARTHUR L. ALBERT
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HERE IS FOURTH article in series on fundamental principles of electricity involved in the operation of telephone equipment. It deals with the principles underlying measurements in direct current circuits.

THE telephone worker is often required to make measurements of voltage, current and resistance in direct-current circuits. Although such measurements are usually easily made, the fundamental principles involved are often obscure. These principles will be considered in this article.

The Moving-Coil Instrument: Many interesting instruments for making measurements in d-c circuits have been developed and some of these have been used. Of all of these, however, the moving-coil instrument is the most widely used and the most satisfactory. In fact, it is used almost exclusively.

Although they may be mounted in various ways and present greatly differing appearances, all moving-coil d-c instruments consist essentially of a coil which is held so that it is free to rotate in a magnetic field. The magnetic field is usually produced by a permanent magnet within the case of the instrument.

The principle of a typical moving-coil element is illustrated by Fig. 1. The coil is wound on an aluminum

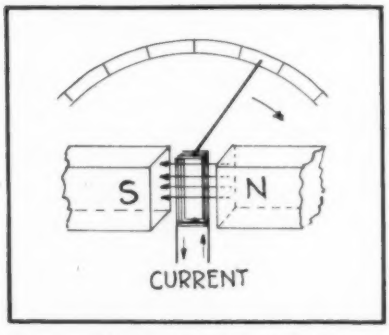

Fig. 1. Simplified Sketch Showing the Essential Parts of the Moving Coil Element Used in Direct Current Voltmeters and Ammeters.

frame and supported at the top and bottom by jeweled bearings. The *N* and *S* poles represent a permanent magnet with the magnetic lines of force shown by the light arrows. (Although magnetism has not yet been considered, it is well known that magnets exert an attractive force on iron objects. The "lines" along which these forces act are termed *lines of force* and are represented by arrows).

The current to be measured (or a part of it) is passed through the movable coil. This current reacts (as will be explained in a later article) with the magnetic field from the permanent magnet, and the coil is caused to turn thus moving the needle across the scale. The motion of the coil is opposed by a hair spring and the deflection of the needle is proportional to the current through the coil.

The coil is of very fine wire and the current is conducted to it by the hair springs which also serve to return the coil to zero position. The resistance of the coil is comparatively high, being of the order of several ohms. The device is quite sensitive, however, and a current of the order of 0.01 ampere will produce a full-scale deflection. These values are very approximate, and instruments are available which are much more sensitive, and thus operate on much smaller currents.

Voltage Measurements: The moving-coil element just discussed is used to measure either voltage or current. The manner in which these measurements are made are, however, quite different. The reason for this is illustrated by Fig. 2. Current flows *through* a device, but voltage exists *across* a device, and is the pressure which causes the current flow. A voltmeter must, therefore, be placed *across* the circuit.

Now, suppose that the voltage of the source is 20 volts and that one of the moving-coil elements having a resistance of 2 ohms is accidently placed *across* the circuit to measure the voltage. The current which would theoretically flow is $I = E/R = 20/2 = 10$ amperes. Of course, the element would be ruined long before this current was attained.

As was mentioned, a current of 0.01 ampere may be sufficient to produce a full-scale deflection. Then, for voltage measurements, sufficient *resistance should be placed in series* with the element to limit the current to 0.01 ampere maximum. This resistance should be $R = E/I = 20/0.01 = 2{,}000$ ohms. But, the moving coil has 2 ohms' resistance, and hence $2{,}000 - 2$, or 1,998 ohms, should be added in series.

In actual voltmeters the series resistance is usually within the case of the instrument. In some instances, however, it may be outside. This is especially true where separate multipliers are used to extend the range of an instrument. Thus, suppose that it is desired to use an instrument having 2,000 ohms total resistance between its terminals to measure in a circuit of about 100 volts. How much external resistance must be added to make this possible?

The current must not exceed 0.01 ampere or the needle will deflect off scale and may damage the instrument. Hence for measuring 100 volts maximum, the total series resistance, $R = 100/0.01 = 10{,}000$ ohms. But the resistance of the instrument is 2,000 ohms. Thus it will be necessary to add 8,000 ohms in series externally, and connect this final arrangement across the line wires.

The instrument just considered has a resistance of 100 ohms for each volt it can measure. This is sufficient for some work, but in most communication circuits a more sensitive instrument is desirable. The current of 0.01 ampere or 10 milliamperes taken by the voltmeter may be

greater than that taken by the load, and thus true circuit conditions are not measured.

Thus, suppose an instrument of this type is used to measure the terminal voltage of a vacuum-tube rectifier which might have an internal resistance of 3,000 ohms. If the open-circuit voltage of the rectifier is 200 volts, the voltage measured by a voltmeter taking 10 milliamperes would be 200—(0.01 × 3,000)= 170 volts, a misleading value.

Now, suppose a more sensitive voltmeter taking only 0.001 ampere or 1 milliampere were used. The voltage read by the voltmeter would be 200—(0.001 × 3,000) = 197 volts, which is approximately correct. Very sensitive, high-resistance voltmeters are desirable for most communication work.

Current Measurements: As shown in Fig. 2 an ammeter must be connected in *series* in a line wire to measure the current. Suppose that the current is 10 amperes. It is apparent that such a large value cannot be passed through a moving coil, and

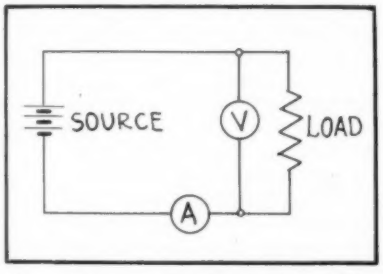

Fig. 2. Current Flows Through a Device But Voltage Exists Across It. Voltmeter is Connected Across a Load While Ammeter is in Series With Load.

that most of it must be shunted around the coil.

To illustrate the design of an ammeter, assume that one of the moving elements of Fig. 1 having a resistance of 2 ohms and a sensitivity such that 0.01 ampere will produce a full-scale deflection, is to be used to measure 10 amperes maximum; that is, in an 0-10 ammeter. The arrangement used would be as in Fig. 3. The problem is to design a shunt such that the currents will divide as shown.

This problem involves parallel circuits. One of the fundamental laws of a parallel circuit is that the voltage across all parts of a parallel circuit is the same. The current through the moving element is 0.01 ampere and its resistance is 2 ohms. The voltage drop is, therefore, $E = IR = 0.01 \times 2 = 0.02$ volt.

The current through the shunt at maximum deflection will be 10 — 0.01 = 9.99 amperes. The voltage across the shunt is also 0.02 volt, and its resistance must, therefore, be $R = E/I = 0.02/9.99 = 0.002002$ ohm. It is evident that shunts must be accurately made.

In most ammeters the shunt is placed inside the instrument case. In some instances, however, external shunts are supplied to extend the range of an instrument. Thus, suppose it is desired to extend the range of the 0-10 ammeter just considered so that it will measure 100 amperes. The current through the external shunt will be 100 — 10 = 90 amperes. This current must cause a drop across the shunt of 0.02 volt, since it is in parallel with the rest of the instrument.

The resistance of the external shunt will, therefore, be $R = 0.02/90 = 0.000222$ ohm, and it would be connected across the instrument. It must, of course, be able to carry 90 amperes without appreciable heating; and the temperature coefficient of resistance must be low so that the reading of the instrument will be independent of temperature changes.

Resistance Measurements: Resistance is one of the fundamental properties of an electric circuit, and it is natural that many ways should have been developed to measure it. Of all these methods, the ammeter-voltmeter methods, the Wheatstone bridge methods, and the voltmeter method are the most important to those engaged in communication.

The ammeter-voltmeter method of measuring resistance is shown by Fig. 4-A. The battery, B, sends a current through the unknown resistor, R_x, under test, and this current value is measured by the ammeter, A, and regulated by the rheostat, R. The voltmeter, V, measures the IR_x drop which this current causes in the resistor under test. Then, from Ohm's law, $R_x = E/I$, the value of the unknown resistor can be found.

For an example, suppose that the current, I, as shown by the ammeter, A, is 5 amperes, and that the voltage, E, as read by the voltmeter, V, is 20.75 volts. Then, the resistance of the unknown resistor is $R_x = 20.75/5 = 4.15$ ohms.

There is an error, which is often of importance, in this method. The current, I, which the ammeter indicates is *not* the true current through the resistor, R_x, is composed of *two* currents: first, that through the resistor, and second, that through the voltmeter.

Now, if it should happen that the resistance of R_x is close to the resistance of the voltmeter, an error will be introduced. Thus, suppose that the resistance of the voltmeter is 2,000 ohms, that the test current I is 0.1 ampere, and that the voltage shown by the voltmeter is 189 volts. If the current through the voltmeter is neglected, then $R_x = E/I = 189/0.1 = 1{,}890$ ohms. But this is incorrect.

The value of 1,890 ohms is not the true resistance of R_x, but is the resistance of the parallel circuit consisting of R_x and R_v in parallel. To find the true value of R_x, the current through the voltmeter should be subtracted from the current the ammeter indicates. Thus, the current, I_x, through the resistor equals the total current minus that through the voltmeter, or $I_x = I - I_v$.

The value of I_v is equal to the voltage read by the voltmeter divided by

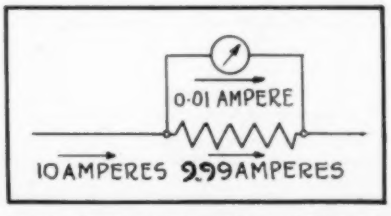

Fig. 3. Problem of Ammeter and Measurement of Large Currents is Solved by Use of Shunt.

Answers to Problems in Third Article, "Conductors and Insulators"

The following are the answers to Problems 3, 4, 5 and 6 concerning principles of electricity, given in the third article of this series entitled "Conductors and Insulators," published in the January 19 issue of TELEPHONY:

3. 0.0001425 ohm.
4. 0.0003085 ohm.
5. 8.94 ohms.
6. 187.6 ohms.

the resistance of the voltmeter. Then, $I_x = 0.1 - (189/2{,}000) = 0.1 - 0.0945 = 0.0055$ ampere. The *true* value of R_x is then $R_x = 189/0.0055 = 34{,}360$ ohms; and this *certainly is not* the 1,890 ohms previously calculated for R_x.

Thus, if the value of the resistance to be measured is high, so that the current through the voltmeter is more than a few per cent of the current indicated by the ammeter, the connections of Fig. 4-A should not be used. In other words, the arrangement of Fig. 4-A should only be used when the resistance of the voltmeter is of the order of 100 times the resistance of the unknown resistor. That is, this method is best adapted for measurements of low resistances up to about 100 ohms, depending, of course, on the voltmeter used.

If the conditions just explained are not met—that is, if the current through the voltmeter is more than a few per cent of the current through the resistor—then the connections should be made as in Fig. 4-B. In this circuit the ammeter reads only the current through the resistor, but there is another error: The voltmeter reads the *IR* drop across the ammeter in addition to that across the unknown resistor.

Thus, if the value of the resistance to be measured is low so that the voltage drop across the ammeter is more than a few per cent of the voltage indicated by the voltmeter, the connections of Fig. 4-B should not be used. That is, this circuit is best adapted to measuring high resistances as compared with the other method just outlined and discussed.

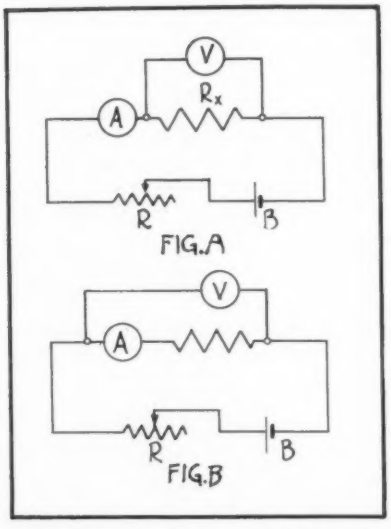

Fig. 4. Application Ammeter–Voltmeter Method of Measuring Low and High Measuring Resistances.

The Wheatstone Bridge: The Wheatstone bridge of Fig. 5 is one of the oldest and most satisfactory devices for measuring resistance. When the switch is closed and the galvanometer across the bridge does not deflect, the bridge is balanced and the resistance can be calculated.

Since the galvanometer does not deflect, it has no current through it, and the two points across which it is connected *must be* at the same voltage or potential. For this to be true, the voltage drops I_1R_1 and I_2R_2 must be equal. Also, for the same reasons I_1R_3 and I_2R_x must be equal. From this first relation, $I_1/I_2 = R_2/R_1$, and from the second $I_1/I_2 = R_x/R_3$.

These two relations can, therefore, be written:

$$R_2/R_1 = R_x/R_3, \text{ and } R_x = R_2R_3/R_1 \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

To operate the bridge, therefore, the resistances are adjusted until the galvanometer does not deflect when the switch is closed. Then, the resistance of the unknown R_x is given by equation (1). In actual bridges, R_2 and R_1 are often called "ratio arms," and are designated by A and B. For greatest accuracy, the values of R_1, R_2, and R_3 should be of the same order of magnitude as R_x.

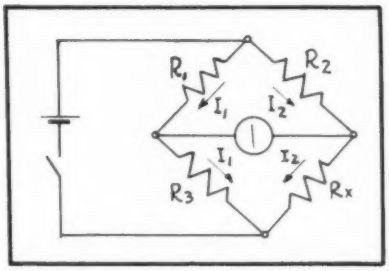

Fig. 5. Wheatstone Bridge Method of Measuring Resistance.

High-Resistance Measurements: Although many special devices and circuits are available, the voltmeter method is one of the most satisfactory. It is widely used in telephone measurements, especially for measurements of line insulation resistance. The circuit arrangement is shown in Fig. 6. A 0-100 volt, high-resistance voltmeter of about 100,000 ohms' resistance is very satisfactory.

The voltmeter is connected in series with a battery of perhaps 100 volts (radio B batteries are excellent) and to ground. The other side is connected to the telephone wire. The path for current flow is completed through the "leaks" to ground. It is these paths consisting of leakage over insulators, through branches of trees, etc., which reduce insulation resistance. Note that these leaks are *in parallel.*

Now, suppose that the battery voltage is 100 volts, the internal resistance of the voltmeter is 100,000 ohms, and that when the voltmeter is connected as shown in Fig. 6, it reads 3.7 volts. It is desired to find the resistance equivalent to all the parallel leakage paths to ground (or between wires if the insulation resistance between wires is desired).

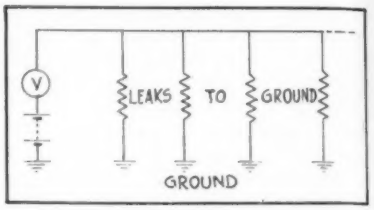

Fig. 6. Voltmeter Method Applied to Measuring Line Insulation Resistance.

If the voltmeter reads 3.7 volts as stated, 96.3 volts must be dropped across the equivalent parallel path (the resistance of the wire itself being negligible). This 96.3 volts is an *IR* drop, and if the I can be found, the insulation resistance, R, can readily be computed.

The same current, I, flows through the voltmeter and the insulation resistance; also, a voltmeter reads the *IR* drop across itself. Thus, $I = 3.7/100{,}000 = 0.000037$ ampere. This current causes a 96.3-volt drop across the insulation resistance, and hence this value of resistance is $R = 96.3/0.000037 = 2{,}610{,}000$ ohms.

This method has sufficient accuracy for most work, and is fool-proof. For example, if the line is accidentally short-circuited at the distant end, the voltmeter is not damaged, but merely reads the entire battery voltage.

Summary: Voltage and current measurements are usually made in direct-current circuits with a moving-coil instrument. The same type of coil is used in the voltmeter and the ammeter. The voltmeter has a high resistance in *series* with the moving coil, and the ammeter has a low resistance shunt in *parallel* with the coil.

Direct-current resistance is conveniently measured by the ammeter-voltmeter method. There are two ways of making the connections, depending on the relation of the resistance to be measured to the internal resistance of the voltmeter.

The Wheatstone bridge is widely used for measuring resistance. Roughly, its range of usefulness is from 1 to 100,000 ohms.

The voltmeter method is excellent

for making measurements of high resistances from about 50,000 to about 10,000,000 ohms.

Problems:

8. A certain rather insensitive moving-coil element has a resistance of 1.73 ohms, and requires 0.0289 ampere to produce a full-scale deflection. Calculate the value of the resistance to be added in series to make possible the use of this instrument as a voltmeter to measure 50 volts maximum value.

9. Calculate the resistance of a shunt to be used with the element of problem 8 so that it can be used as an ammeter to measure 10 amperes maximum.

10. A voltmeter reads 90 volts when directly connected across a resistor. The current through the resistor is 9.25 amperes. Calculate the resistance of the resistor. State whether the voltmeter should be connected as in Fig. 4-A or 4-B.

11. A 0-100 voltmeter having an internal resistance of 100,000 ohms is connected between a telephone line and ground through a 100-volt battery. The voltmeter indicates 2.6 volts. Calculate the insulation resistance of the line.

12. If the line of problem 11 is 25 miles long, calculate the insulation resistance per mile.

Work out the answers to these problems and hold them to compare with the correct answers. These will be published with the next instalment in this series of articles on electrical fundamentals for the telephone worker.

Here and There In Telephone Work

"Tillie Fone" Tells Why Extension Set Is Needed

The following article did not appear in the society column of our local newspaper, but it has occurred to me that if it should appear, there would certainly be a large number of live prospects for extension telephones:

A social tragedy took place yesterday at the home of Mr. W. W. Weems who had guests in for dinner, when Mr. Weems, who had discovered that his suit was still at the tailor's, made a desperate effort to get to the only telephone in the house. In his underwear, Mr. Weems tried to reach for the telephone located in the living room in which the guests were waiting, when he stumbled. The dinner guests and the host were very much embarrassed and the dinner has been postponed until Tuesday of next week.

To prevent the possibility of an embarrassing incident like this most of the housewives in town would be in the office begging for an extension telephone in the bedroom. I believe we would be swamped with orders. But taking an order is too easy. I would rather go out and talk to these women, show them the real needs for an extension telephone in the bedroom.

There are a number of reasons why extension telephones are needed that can be used effectively to convince prospective customers that they need extension telephones.

Some of them are as follows:

1. An extension saves embarrassment when the maid or cook receives a telephone call she must answer in a room in which others can see and hear her.
2. It will keep guests or other persons from overhearing your conversation.
3. Is convenient for placing or receiving calls late at night.
4. Provides a feeling of security, as police, fire department, or physician may be called in an emergency.
5. Provides a convenience during illness. The telephone may be located near the bed.
6. The cost is very reasonable, only a few cents a day.
7. Saves steps, as telephone may be answered from more than one location of the house.
8. Saves getting up on chilly nights to answer telephone.
9. Prevents accidents, as one may be hurt groping in the dark for a light so that the telephone may be answered.

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Lincoln (Neb.) Company Plans 1935 Sales Activities

Thirty-five area and district managers connected with the Lincoln Telephone & Telegraph Co., Lincoln, Neb., met January 18 with H. F. McCulla, general commercial superintendent, to discuss the company's 1935 program of sales activities.

J. H. Agee, general manager, reviewed the work of the commercial department for the past year, and with Mr. McCulla, who followed him, paid tribute to the industry, intelligence and enthusiasm of the employes as a whole in support of the 1934 program for resisting the pressure of economic conditions.

"For the first time since 1929," said Mr. McCulla, "the company finished the year with a real gain in the number of stations operated. Improvement in general business conditions was reflected in the 11 per cent increase in long distance collections and use of toll facilities."

Much of the success of the past drives, he stated, could be traced to the good relations the company, through its men and women in the field of sales and service, had been able to maintain with the customers. This, he said, would be a strong factor in bringing back, when conditions permit, those who had been forced to discontinue service.

"Let us not lose sight," he said, "of the importance of every contact with the public in 1935, regardless of its nature. Not only should our everyday activities attain the highest possible degree of perfection, but every employe should be so informed about our business that he can intelligently explain our policies and practices to everyone."

A number of important matters in connection with sales work were discussed. These included new employe sales participation plan, sales honor plan, community building plan, sale of Postal Telegraph services, commercial service studies, 1935 advertising plans, collection practices and employe sales training. At the close, the quotas for the year were given out.

Assisting Mr. McCulla in the conference program, which included illustrated lectures, were Clyde Burge, commercial engineer; C. W. Motter, publicity director; Kenneth Lawson, sales training supervisor; B. I. Noble, commercial results supervisor; Merle Hale, directory supervisor; J. S. Jackson, special clerk, and G. O. Seaton, collection manager.

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Ohio Commission Employe's Long Record

Having served the state of Ohio for a trifle more than 35 years, David Archer, assistant secretary to the Ohio Public Utilities Commission, occupies a unique relation to the administration of affairs in the state, and probably enjoys an acquaintance equal to, if not greater, than most men who have been associated with public life in Ohio.

"Dave," as he is familiar known by his vast circle of acquaintances, back in June of 1899 was a senior in high school

FLASHES AND PLUGS

Thirty years ago Chicago had only 10,000 residence telephones.

* * *

Rudyard Kipling, the famous English author, has never had a telephone as he wanted to guard his privacy. There is a job for a British telephone salesman who has American "go-getting" proclivities.

* * *

It is estimated that one-sixth of all the telephones in the United States are located in one-twelve-hundredth of the national area—New York and New Jersey territory.

* * *

A columnist in the Chicago Daily News defines the "overprivileged" class as a man who saved enough money to buy a raccoon coat—and still has it—or a business man who has three telephones on his desk.

* * *

The ten members of the fur dealers NRA code held a round-robin meeting by telephone, the hook-up including Chicago, New York, St. Louis, Minneapolis and Washington. The conference lasted an hour and cost $200, but saved $3,000 in expenses of a Washington meeting.

* * *

Telephone girls in Berlin, Germany, are required to spend a certain period every day in exercising their vocal cords.

* * *

One-seventh of all the telephone calls to ascertain the time of day come in between 7:30 and 8:30 a. m.

* * *

"There is no more integral part of the community life of a small town than the telephone operator," says the Peoria (Ill.) Star. "Not a day passes but she renders real service locating the family doctor, calling the fire department, or bringing messages of cheer or heartbreak to the folks she serves so well."

* * *

A unique telephone directory, published in Chicago, contains the names of only persons of Finnish descent.

in Columbus at which time his father was chief clerk to the commissioner of railroad and telegraphs in the days before public utilities commissions were known.

One morning the senior Archer advised his son that his stenographer had given up her position and requested him to report at his office and do what typewriting was necessary. That was the beginning of "Dave's" association with affairs of state which has continued without a break down to the present.

After the office of commissioner of railroads and telegraph was abolished, to give way to the newly-created public service commission, Dave Archer retained his connection with the department as he did when the latter body gave way to the public utilities commission which was created to have jurisdiction over all public utilities doing business in the state.

During his career, Mr. Archer has witnessed extensive development in many of the utilities including wide development of railroads, gas and electric companies and telephone companies, as well as those of all other types.

It was in the early days of his association with affairs of state that patents, held by the Bell telephone interests, began to expire, and he saw the Independent telephone companies start to spring up and develop. In later years, he has witnessed great advancement made in both Independent and Bell telephone properties.

Naturally, his acquaintance is wide among those associated with both of these branches of the industry in Ohio, and this acquaintance has extended even far beyond the boundaries of the state.

In the telephone industry, as well as in others, he is a veritable encyclopedia of information so far as their connection with the Ohio Public Utilities Commission is concerned and he can either give an immediate answer, or at least place his finger on the right source of information concerning public utilities of the state when inquiries are received.

Only long years of experience and association with this particular line of work could place one in possession of such a wide range of knowledge.

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Rural Mutual Telephone Lines in Canada

Anent the recent and current efforts of the Alberta government to induce the sale of its rural telephone properties throughout that province, the Hon. George Hoadley, minister of telephones and health, recently issued the following statement. It gives details by which residents of rural communities may take over the mutual operation of their telephone lines, as well as explaining why such action should be taken everywhere in the best interests of the general telephone-using public:

"The plan under which these mutual companies operate has been simplified as much as possible. Groups which have mutual community interests are usually the basis and are adjusted so that each company can reach the exchange over its own line or the department's long distance lines.

The number of poles and miles of wire are ascertained and priced at a flat rate of 30 cents per pole and one cent per pound for the wire—$3.40 per mile of two wires. Insulators and other line material are included with these two major items. Telephones are priced at $7.50, which figure includes the lightning arrester and the wiring. Each subscriber and prospective subscriber becomes a shareholder and the cost is divided. The purchase price may be spread over two or three years, if so desired.

It is hoped that this plan will enable the rural telephone users to retain their service at a low initial cost and to maintain it with the use of their own labor. The service fees have been set at 60 cents per month for continuous service and 40 cents for day service. These are remitted to the department by the secretary of each local rural company or group."

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Fog Spurs Ship-Shore Telephone Traffic

Telephone traffic with ocean liners lying fog-bound in Ambrose Channel near New York broke all records on January 8 with a total of 41 calls. Traffic on January 7 was also heavy. The previous record on the ship-to-shore service was established on December 21 last when 34 calls were handled with ships delayed by the gale then raging. Twenty-eight of these were with the Europa.

Thirty-four of the calls on January 8 were with the Empress of Britain, which also had most of the traffic the previous day. The rest were with the Majestic and the New York. A majority of the calls were inward, from passengers, and most of them were to New York or vicinity, although several involved points in Canada, Ohio, North Carolina and Florida.

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Foreign News Briefly Told

Jugoslavia had 42,606 telephone subscribers at the close of 1933, 24,228 of them being served by machine-switching apparatus. Of the 1,278 telephone exchanges in that country, 608 were owned by the state and 670 were operated under private contract. 144,400,000 calls were completed in 1933, of which 533,200 were international, according to the consulate at Belgrade.

* * *

Radio telephone service was recently extended by the United States to Algeria, French Morocco, Tunisia and Saigon, French Indo-China.

Telephone Rates vs. Power Rates

IT IS UNFORTUNATE for the telephone industry that it is so often classified, by the press and otherwise, with other utilities—especially the electric light and power industry—in the matter of rates charged for service.

The assumption is prevalent in some quarters that a reduction of telephone rates would be possible if the amount of telephone business could be enlarged. This theory is based upon the idea that the cost of rendering telephone service diminishes as the number of telephones increases. Every telephone man, and everyone familiar with the telephone business, knows that this is not a fact.

There are almost basic differences between the telephone industry and the light and power industry. One of the important differences—and one either overlooked or not understood by the lay critic—is the ability of the light and power industry to develop constantly new and different uses for its services.

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STATISTICS concerning the sale of electric current show that there is practically a "top" on the amount of current used by the average householder for lighting purposes only, and the light and power executive can tell with practical certainty, merely by looking at the monthly bill of a residence customer, whether that customer is using his current only for lighting or whether he is using it for various other purposes.

Those other purposes in the electric field are numerous. Hardly any householder now confines his use of electrical current merely to lighting. The use of current for the electric refrigerator, the washing machine, the radio, the sweeper and all the other multitudinous appliances, including the iron, toaster and so on, is in fact the mainstay of the electric power industry today.

The industry has done a great job in developing and selling all of these current-consuming appliances, and it is through such activities that the industry has been able to make constant reductions in the unit costs of electricity used in the home.

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THE TELEPHONE business, however, has no side lines. It has only two things to sell—exchange service and toll service. During the depression valiant efforts have been made by telephone companies to discover and develop new uses for the telephone, auxiliary to the main service, and revenue-producing.

While in some cases a few things of this kind have been developed and put into use, they have almost invariably been ideas that were good only for local application. They have, in practically all cases, been things that were minor so far as their production of additional revenue was concerned.

Telephone men who have spent many hours thinking and talking about and experimenting with schemes to produce auxiliary revenue in the telephone business have, most of them, reached the conclusion that, after all, the only really revenue-producing services of the telephone industry are its old standbys—exchange service and toll service. Auxiliary services that have been developed to date have in most cases not been worth the expense of development.

The telephone industry is, therefore, in a position vastly different from that of the electric light and power industry. Not only is the telephone industry unable to develop revenue-producing auxiliary services of any importance but its principal source of revenue—exchange service—comes from a service that costs more to produce as the number of telephones in an exchange increases.

This is known to all telephone men and to the regulatory commissions, but it is naturally difficult for the layman, whose theories of cost are bottomed usually on the idea that as quantity increases cost decreases, to understand why the rate per telephone must go up as telephones in an exchange area increase.

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THE DEVELOPMENT of the art of telephony is probably now, more than it has been at any time in the past, trending in the direction of reduced costs in the production of telephone service. It was first necessary to develop the equipment and plant which could produce a high-grade telephone service because, after all, the telephone is a personal service and the user is quick to recognize any inferiority in it.

Every telephone man knows that his subscribers demand, first of all, a high-class service. The very nature of the business is such that unless the service is good it is often useless so far as the subscriber is concerned.

It is worth while to repeat the fact that telephone service is, after all, a personal service. It is the one form of communication nearest approaching face-to-face personal contact. The telephone is an integral part of the home. It is the household instrumentality of social contact and as such the principal aid of the housewife.

Any species or trend of development or regulation that would interfere with the accessibility or use of the telephone in the home, or with the quality of service it renders there, would create such a disturbance from the American householder that the instigator would need all the courage he possessed to live it down.

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IT IS THE DUTY of the telephone industry to make these facts clear to those who often have had no opportunity to obtain them from any other source. It is the duty of the industry to dispel, so far as it can, the

mistaken notion that the telephone industry and the light and power industry are similar, either as to production costs or as to methods of operation.

It is only by hammering away at all concerned that the industry can make it clear to the public that the reason telephone companies do not make rate reductions is not simply because they do not want to do so, but because they cannot do so and still render a high-grade service. Naturally anyone understands that in order to render service of a high caliber, property must be maintained and perpetuated and personnel must be kept to a high point of efficiency.

It must, of course, be assumed that on the whole there is no disposition on the part of regulatory bodies to deal unjustly with the telephone industry. It is the duty of the industry itself, however, to keep the public so acquainted with the facts concerning it that regulatory bodies will be supported by public opinion in allowing the rates the industry must necessarily have in order to furnish service of the high caliber the public requires.

FCC Asks Amendments To Communications Act

LEGISLATION permitting merger of telegraph companies, outlawing exclusive occupancy provisions in telegraph company contracts and placing stringent limitation on the issuance of franks was asked of Congress in a report made by the Federal Communications Commission on January 21.

The proposals, which call for amendments to the communications act, were sent to the Capitol in conformity with a provision of the act, which requires a special report on proposed amendments before February 1, 1935.

Consolidation of the Western Union and Postal Telegraph companies or any other group of companies transmitting "written" messages by land lines, cables or radio would be permitted under the merger proposal. It would not authorize the consolidation of telephone companies with telegraph companies. The consolidation, not to be mandatory, would be left to the companies to work out with the commission's approval.

Although the Bell Telephone System has a wire plant that would enable it to take over the domestic telegraph business of the country, with only comparatively minor adjustments, the commission said that "it is only fair to state, however, that the officers of the Bell System say that they have no present desire either to combine with any telegraph company or to enter the general telegraph message business."

It had been assumed that the merger recommendations would carry President Roosevelt's approval, but the report was submitted to the Senate and House without a White House message. Action is expected first in the Senate.

In recommending permissive merger legislation for the telegraph companies, the commission included labor provisions providing that dismissal compensation and retirement annuities should be paid to any employe dismissed as result of consolidations. The commission also recommended that no employe should be put in a worse position with respect to hourly wages and average monthly wages on account of consolidation than he was on January 1, 1935.

Other conditions for permitting mergers include agreements by the companies involved to commission supervision over extensions of service and abandonment of jurisdiction over rates, and the provision that not more than one-fifth of the stock of the merged company should be owned by aliens.

On capitalization the legislation report said: "The total capitalization shall include nothing for property or equipment in excess of that reasonably necessary to carry out the country's domestic and foreign telegraph business, with due allowance for the prospective future demand for the telegraph service."

Mergers would involve companies—"solely or principally"—engaged in telegraph, cable or radio business and could be carried out by purchase or exchange of securities or by lease. The commission would hold a hearing on the merger applications and if it found the consolidation in the public interest, it would so certify.

In giving reasons for the proposals, the commission told Congress that permissive legislation authorizing existing telegraph companies to merge would result in greater economy, and that a single company would serve the nation best in time of emergency such as war.

"The elimination of unnecessary duplication of facilities should result both in a solvent telegraph industry and in lower telegraph rates," the commission said in its report to Congress. "Where competition prevails, a rate structure which is too low for an adequate return on investment spells insolvency, while one which will permit of an adequate return upon investment is higher than that needed to provide an adequate telegraph service."

The report predicted that "keener competition will be offered by a consolidated telegraph company to long distance telephony and air mail," which the commission regards as monopolistic.

"Telegraph companies are engaged in a fruitless strife with each other, while other means of communication are taking away what has heretofore been telegraph business," the report said.

With working conditions in the industry worse than in 1929, according to the commission, "the real interest of labor will be better served by a unified telegraph industry." Present competition was carried on partly at labor's expense, the report found.

The commission suggested two other changes in the law. One would make it unlawful for any common carrier subject to the act to enter into any contract granting exclusive rights as against any other American-owned and controlled carrier. This is intended to prevent in the future all exclusive contracts between telegraph companies and railroads and hotels.

Explaining the proposed amendment to outlaw exclusive contracts, the commission said that it would be "desirable whether or not legislation was enacted authorizing the merger of telegraph companies."

"The purpose of competition can be served only as the public has freedom to choose between competing carriers," the report stated. "It is believed that most if not all of the exclusive provisions are illegal at the present time. Certainly, the exclusive provisions in contracts between communications carriers and land grant railroads are an open flouting of existing laws and of decisions of the Supreme Court of the United States."

The other change would prohibit any carrier to issue or recognize any frank or render any free service "except in connection with situations involving the safety of life or property, including hydrographic and weather reports and medical assistance to injured or sick persons on ships at sea."

...and where is the little pea?

Buying telephone batteries is sometimes very much like the old shell game. Just as the player must choose the shell which covers the little pea, so must the telephone manager select the battery which will give him the most energy per dollar.

It's easy to be fooled in both games. It's easy to be tempted into thinking that the little pea is under *that* shell. But the foxy old operator shows you you're wrong—and you lose your money. And in the case of battery-buying, it's easy to think that the lower-priced battery gives you the most power for your money. But an accurate operating test will prove you're wrong—and the company loses money.

Make of Cell	Purchase Cost Per Cell	Multiplying Factor to Give True Cost (K)	$\frac{365}{\text{Serv. Life}} = K$	True Purchase Cost Per Cell Required Per Year	Repl. Cost Per Cell Per Year	Total True Cost Per Cell Required Per Year
EVEREADY LONG LIFE	28.5¢	.91	$\frac{365}{400}$	25.94¢	22.7¢	48.64¢
COLUMBIA GRAY LABEL	25.0¢	1.106	$\frac{365}{330}$	27.65¢	27.7¢	55.35¢
CELL C	20.0¢	1.76	$\frac{365}{207}$	35.20¢	44.0¢	79.20¢

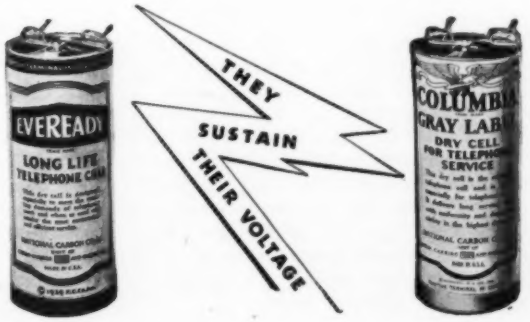
NOTE: *Replacement cost based on 50¢ per pair of cells or 25¢ per cell; this includes labor and car and is very conservative.* Please note that the days of life reported on this schedule are those of laboratory tests and are not comparable with actual operating days of service in that the test specifications are almost double practical application.

The old shell game has about passed out of existence, so we won't attempt to tell you how to select the shell which covers the pea. But we *will* be glad to show you how to select the most economical battery.

Take a look at the chart. Three dry cells are listed: the Eveready Long Life, The Columbia Gray Label, and the cell which proved third-best according to cost and service life . . . we call it cell C.

You can see that the true cost per year of the Eveready Long Life is lower than either of the other two batteries, even though its initial purchasing price is higher than the other two. Try this test in your own laboratory and use your own figures—and you'll find that the Eveready Long Life will show the same lead over all other batteries.

Don't be fooled by low *initial* cost batteries. Buy those which give you the lowest *true* cost for good transmission—which means buy Eveready Long Life or Columbia Gray Label Telephone Batteries. National Carbon Company, Inc., General Offices: New York, N. Y. Branches: Chicago, San Francisco. Unit of Union Carbide UCC and Carbon Corporation.

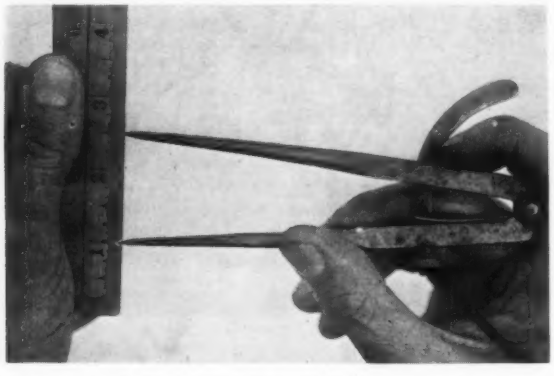


Plant Men Talk Things Over

Useful Ideas: Handy Rule and Divider Kink

The common dividers are often set and spaced on the usual two-foot rule. This is not an easy or handy procedure, as a point cannot be held accurately on the end of the rule, and it is an awkward move to try to hold a compass leg on one of the lightly-impressed division marks.

Right over the "1" inch mark, cut a small "V" nick in the wood of the thin side of the rule. Drop the divider point in this notch, and you will find that moving the other point to the distance wanted is a much easier and more acurate operation. The inch difference is simply a mental addition instantly made. This method makes the procedure much handier and it is always accurate.



Spacing the Common Divider on a Two-Foot Rule Made Easier by Notching the Rule at the "1" Inch Mark.

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Test Day: Put on Your Thinkin' Caps

By JAKE, THE LINEMAN

Mornin' buddies. A few days ago I received a letter from an old pal and buddy, Walter Sheldon, of Edmore, Michigan, and he said ter me: "Jake, you old duffer, why don't you start giving us boys a few tests? We've got plenty of time on our hands and I am sure every buddy would appreciate a chance to test his knowledge of safety. Come on, Jake, let's have some tests."

Well, Walt, I've been a' thinkin' about your letter quite a bit durin' the past few days and as a result I have decided to start havin' our regular tests again. If I can get every buddy interested, we are going to have a test every month, and, believe you me, we are going to have tests "what am" tests.

Not long ago, Hamilton Wright Mabie said: "Nothing is lost upon a man who is bent upon growth; nothing wasted on one who is always preparing for his work and his life by keeping eyes, mind and heart open to nature, men, books and experience. Such a man finds ministers to his education on all sides; everything cooperates with his passion for growth and what he gathers serves him at unexpected moments in unforeseen ways."

I've sorter studied that little quotation over an' it's come ter mean a lot to me. I wish all you fellows would study it over. I don't know how many buddies I have gained during my years wtih TELEPHONY but I know there are hundreds of them. Nothing is too good for any of you. You have stood by me for a long time. A word here and a word there helped me to keep the old typewriter clicking, and now I am going to show you I am your buddy as well as you are mine. If my plan helps you fellows who are interested in safety, my time will have been well spent.

Some time ago I tried to get a Safety Club started among you buddies, but it did not go over so hot because of the existing conditions. But now using our regular monthly tests as a nucleus, we are going to start on that club again.

Today we are going to start things a' rollin' with a big test on safety. I want every fellow who has ever read my articles to write out the answers to the questions. I don't care how you write them—pencil, pen or typewriter. Just write them and send them to JAKE, THE LINEMAN, care of TELEPHONY, 608 South Dearborn Street, Chicago, Ill.

They will come right to me and I'll take good care of them. First of all, I'll check them and grade them. And then as soon as they are all graded I'll send them back to you with a complete copy of the correct answers, a list of the five buddies who turned in the best papers, and a little bulletin, put out by myself, covering the seasonal dangers and hazards to be on the lookout for, and a few health and first aid rules for you to store away in the old thinker.

So come on, you telephone workers of this country and the rest of the world. I need everyone of you to get this thing going. This is test No. 1 of 1935. I plan to have 12 tests this year—one on the last Saturday of each month. To everyone who answers the questions each month, it means a chance to test his knowledge of safety; a chance to prove to his employer that he is doing his best to learn all about safety; an interesting copy of the correct answers for your future study and use; and a free copy of an up-to-the-minute bulletin covering safety, health and first aid.

Sharpen your pencils—here are the questions:

1. In lowering a pot of hot liquid to a splicer in manhole, should the splicer's helper be facing the traffic? Should he allow his eyes to roam around or should he keep them centered on the pot until it reaches its destination? Explain your reasons for your answers.
2. To what temperature can paraffin be heated safely? How is the best way to keep check on the temperature of heating paraffin?
3. When boiling out wires, why is it important that the wires be lowered into the paraffin slowly?
4. In making inspections of your body belts, name some of the defects which you should be on the lookout for.
5. In your opinion what is the first duty of older employes to new employes?
6. When should a worker remember to put on his goggles? Give five types of jobs on which a worker should always wear his goggles.
7. When removing insulators, is it a safe practice to remove them by breaking them off with your pliers and allowing the pieces to fly? What in your opinion is the safest method of removing insulators.
8. Is it a safe practice to wear rings while you are handling hot liquids or hot solder? Give reasons for your answers.
9. Should a worker wipe a joint or bond from a cable car or from pole steps? If not, what should be used? Give reasons for your answer.
10. Describe fully an accident, which you believe could have been prevented had the victim practiced safety.

Wa'll there they be, buddies, and now let's have your answers. Get started on this year of safety by getting in at the start of these monthly tests. To keep the tests going, I have to have hundreds of replies. Now what about it? Get your answers in as soon as possible. Until next Saturday remember: "A mind once cultivated will not lie fallow for half an hour."

A NEW HIGH SPEED LINE TRUCK!

TWENTY-FIVE YEARS OF PROGRESS
FWD TRUCKS
1910 · 1935

...y-six lockers with a total of 96,440 cubic inches pro... for necessary line tools, equipment, and supplies

The **H-S makes an ideal line construction and maintenance truck because it goes far beyond the usual qualifications for such units. It has speed to move from place to place with a minimum of lost time. It has abundant power and the traction of four driving wheels to pull through the tough places to get to location. It has a live, set back front axle which makes it easy to handle and one of the safest trucks on the road to operate; especially so since it has two independent sets of four wheel brakes. . . . It is a good looking truck. It is an economical truck because it puts more of the power developed to actual work in moving the load. It is easy to maneuver in cramped places because of its short wheelbase, wide tread and short over-all length. It is built with the same care and precision as all other FWD products and will give long trouble free service.**

FIVE DEFINITE ADVANTAGES IN USING FWD TRUCKS

Greater Safety. Front axles are set back. *Power*, as well as load on all four wheels, gives the FWD sure footing on slippery pavements, in congested traffic, and when going around curves.

Greater Dependability of Service. Reserve power, rugged construction throughout, and true application of the four-wheel drive principle, insure continuous operation under any condition. Backed by a nation-wide organization of parts depots and service men available at a moment's notice.

Faster Service. FWDs, with their powerful engines, wide range of gear ratios and four-wheel traction cut down trip time by being able to "make" the hills, curves, and poor going, faster than average trucks. No necessity for overspeeding on the straight stretches.

Wider Range of Operation. Four-wheel traction enables the FWD to handle its regular hauling job easily and do the tough jobs as a matter of course.

Operating Economy. Definite savings are made in gasoline, tire wear, maintenance cost, and other "out-of-pocket" expenses. This is the result of equal distribution of power and load and scientific four-wheel drive construction throughout.

FWD TRUCKS

THE FOUR WHEEL DRIVE AUTO COMPANY, Clintonville, Wisconsin
Canadian Factory: Kitchener, Ontario

☐ The Snow Removal Problem ☐ Use of Extreme Pressure Lubricants ☐ Truck and Trailer Size and Weight Restrictions ☐ Effects of Front Wheel Stability on Public Safety ☐ Purdue University Efficiency Test ☐ Cutting Costs with the FWD Road Maintainer ☐ Making the most of Controlled Power.

Mr. _____ Title _____

Address _____

City _____ State _____

BACKED BY NATION-WIDE SERVICE

Lincoln (Neb.) Company Reports a Trying Year

Stockholders at the annual meeting of the Lincoln Telephone & Telegraph Co. held at Lincoln, Neb., January 15 re-elected the old board of directors, who will later choose officers. No change in the latter is now contemplated. Directors for the year are Commodore N. Beaver, York; G. E. Coddington, Auburn; L. B. Stiner, Hastings; L. E. Hurtz, Omaha; Christian Klem, Beaver Crossing, and Joseph Grainger, J. H. Agee, Charles Stuart, Frank H. Woods, Thomas C. Woods, George J. Woods and Mark W. Woods, Lincoln.

The annual report of the officers related that the year 1934 began with greatly improved prospects of a return of stations, particularly in the farm field. Between January 1 and May 1 the company gained 1,420 stations, following a well-planned drive for new business. By early May it was apparent that the lack of rainfall had seriously injured the winter wheat crop, and within a few weeks thereafter the drought had taken what later proved to be a 90 per cent toll of the corn crop, along with small grains.

These changed conditions in the rural areas was reflected in a heavy loss of stations. Between May 1 and October 1 the net gain of the first four months had disappeared and a net loss of 799 stations was chalked up. With the greatly-improved prices in grains and the government corn loans and payments for eliminating acreage and cutting down hog production, the financial conditions of the farmer had so greatly improved that it was deemed advisable to launch another drive.

During November there was a net gain of 1,130 stations, so that by the end of the year the record was again reversed and a gain of 521 stations registered.

One of the vexing problems of management is in connection with the small exchange in the small towns. The dwindling population and the shifting of trading centers to larger towns, a product of the automobile era, in addition to bad economic conditions in rural areas, has caused a heavy shrinkage in the number of stations connected with the smaller exchanges, many of them to the point where operation results in out-of-pocket losses.

Expenses have been cut to the limit. In some cases it has been necessary to close the exchange and provide service from another or from adjoining exchanges. The company installed and has been operating for some time at the town of Nehawka, a small town in Cass county, dial or mechanical switching equipment, which calls for no attendance. The success of this experiment may be the company's answer to the problem presented by the small town exchange.

With the hearty cooperation of merchants in the smaller towns, the company is trying out a community building plan intended to restore in large part the importance of these towns as trading centers. This plan calls for extensive use of the telephone and is expected to develop into a strong demand for telephones on the farms.

While exchange revenues have fallen off slightly, there has been an increase of 10.46 per cent in toll revenues. It was not, however, until 1934 that the full effect of the enforced increase in expenses called for by shorter hours and minimum wages was felt. The increased revenues were insufficient to bring the company figures back into the black, after taking care of the 6 per cent preferred stock and 7 per cent common stock dividends.

The better morale among the farmers and the encouraging business outlook were noted as factors tending to betterment of conditions during 1935.

The company now has assets of $14,485,000; preferred stock outstanding of $3,450,000, common stock $2,575,000 and bonds of $3,500,000, with a depreciation reserve of $3,284,909 and a surplus of $806,524, an increase for the year.

Exchange revenues for 1934 were $1,728,478, a decrease of $6,523; toll revenues, $658,702, an increase of $62,178; miscellaneous revenues, $111,891, an increase of $27,753. Total revenues were $2,499,071, an increase of $83,408.

Traffic expenses were $350,114, an increase of $43,093; commercial expenses, $287,054, an increase of $21,149; general expenses, $213,808, an increase of $15,436, and other expenses, $17,071, an increase of $2,851. Total telephone expenses were $868,047, an increase of $82,529. Maintenance costs were $490,610, an in rease of $51,657; depreciation, $398,580, a decrease of $65,639 (a new rate of 3.50 per cent being ordered set up for the year by the state railway commission); taxes, $214,821, an increase of $3,575. Total expenses were $1,972,058, an increase of $72,122.

Net earnings were $549,337, an increase of $8,425, and interest deductions, $177,029, a decrease of $351. This left a balance for net profits of $372,308, an increase of $8,776.

Preferred stock dividends paid totaled $154,545, an increase of $3,258, while common stock dividends paid were $241,504, a total dividend payment of $396,049, or $23,741 more than net profits. This, however, was $5,518 less than the corresponding deficit of 1933.

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Answers to the Traffic Questions on Page 11

1. On local multiple connections having voluntary supervision, if the called station does not answer within 30 seconds after the operator's acknowledgment of the call, say to the calling party, "I am trying to get them," and continue ringing. On local multiple connections where you do not have voluntary supervision, if the called station does not answer within two minutes from the establishing of the connection, give a preliminary report to the calling party, saying: "They have not answered yet. Shall I keep on ringing?"
2. On post-payment coin-box calls a split connection is used in obtaining the called station, using as far as possible adjacent idle pairs of cords.
   On a local call from a pre-payment coin-box it is assumed that five cents has been deposited unless it is otherwise stated by the calling party and a connection to the called number is established immediately.
3. Yes.
4. Your toll center is responsible for clearing the circuit.
5. Yes.

Kansas Convention To Be Held in Topeka

The directors of the Kansas Telephone Association have selected April 10 and 11 as the dates on which to hold the annual convention of the association. The meeting will be held at Topeka in the Hotel Kansan, and Secretary H. B. Couch, of Topeka, states that the program will be announced later.

Doings of Various Commissions and Courts

Two Small Companies Subject to FCC Jurisdiction

The telephone division of the Federal Communications Commission, composed of Commissioner Walker, chairman, and Commissioners Case and Sykes, on January 17 decided that the Du Bois Telephone Co., of Du Bois, Neb., and the Fort Kent Telephone Co., of Fort Kent, Me., are subject to the jurisdiction of the commission.

To provide a reference file for the general public it was decided to require all telephone companies subject to the jurisdiction of the commission, to file duplicate copies of their schedules of charges submitted to the commission in response to order No. 1 of the telephone division.

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Bell in Tennessee Accepts Reduced Rates

Downward revision of telephone charges, estimated to total $153,000 yearly in Memphis, Tenn., and more than $475,000 over the state, was accepted by the Southern Bell Telephone & Telegraph Co. on January 10.

J. H. Baker, state manager for the telephone company, announced in Nashville that the company had decided to accept the order, recently issued by the Tennessee Railroad & Public Utilities Commission (TELEPHONY of January 12).

The reductions, effective February 1, average about 10 per cent and are accompanied by a slight reduction in the telephone company's rate base and depreciation charges.

Cities of Tennessee, led by Memphis, made a two-year fight for the reductions, asking that the rates be reduced 20 per cent.

In a statement, Mr. Baker said that the Southern Bell "has never been able to earn more than a fair return upon its capital invested in rendering telephone service," in Tennessee.

"The order of the commission will have the effect of materially reducing the company's revenues," he continued, "and we feel that upon the evidence introduced in these proceedings no reduction in the company's revenue was justified, but with the full consideration of the cost involved in court proceedings and special consideration for the effect upon the cordial relations now existing between the company and its customers throughout the state, we have decided to accept the order of the commission and try out the rates prescribed therein."

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Mississippi Hearings in Bell Investigation

Following a number of hearings this month, accepting testimony in its investigation of the rates of the Southern Bell Telephone & Telegraph Co., the Mississippi Railroad Commission adjourned the sessions until February 5. The commission some time ago issued a citation against all telephone companies in the state of Mississippi to show why they should not reduce exchange rates.

The citation was issued after an opinion was given out by Attorney-General Greek L. Rice, holding that the commission has the right to fix telephone rates, despite a federal injunction of some ten years ago.

As the hearing opened on January 15, the commission called for a detailed "breakdown" of the operating expense and income of the Southern Bell Telephone Telegraph Co.'s operations in Mississippi for 1932. Several technical exhibits, showing property investments, revenue and operating costs of the company, were introduced by W. E. Duncan, of Atlanta, Ga., assistant to the chief accountant of the company.

Further valuation data, in support of its claim that rates should not be reduced to levels that would not permit it to earn a "fair return" on its investment, was introduced by the Southern Bell at the January 16 hearing. Mr. Duncan was recalled to the witness stand for cross-examination. In response to a request of the commission he submitted, in detail, figures on the company's plant.

L. W. Hill, of Atlanta, revenue and cost engineer, gave estimates on the cost of reproduction of the company as a

Nature Never Declares a Moratorium

Destructive forces are constantly at work wearing down your outside plant.

The judgment, experience, cost and operating figures of telephone engineers prove that the best outside plant is the cheapest outside plant.

Cook All Steel Protected and Unprotected Pole Cable Terminals have extended the normal life of outside plants many, many years by their ability to resist these destructive forces.

Profit by the experience of the majority — Specify COOK Terminals.

Cook Electric Co.

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CHICAGO

"going concern," which the company contends must be considered along with the original cost and other relative factors in determining a valuation on which to fix rates.

T. P. Goodwin, commission counsel, who the day before objected to the use of the replacement cost theory in figuring depreciation, took issue with Mr. Hill's estimates of the company as a "going concern."

Mr. Goodwin claimed that estimates on the reproduction of the physical plant constituted a duplicate entry. He was not satisfied with the explanations of Mr. Hill and Edward Smith, of Atlanta, the company's general counsel, that it was the practice in determining a rate base to use such figures, and said he would take up the subject later in the hearing.

At the hearing on January 18 further statistical data, adding to an already high pile of exhibits submitted by the company, was given by R. M. Goodman, commercial supervisor, and George J. Yundt, vice-president and treasurer. Mr. Goodman, in answer to a question by Mr. Goodwin, commission counsel, said he did not think a reduction in rates would stimulate the company's business.

Discussing margins of surplus laid aside for future growth, Mr. Goodman explained at length the process of commercial surveys made by the company to forecast growth of cities it serves, theoretically sell service to the future population, but said the survey as a yardstick had been affected by economic conditions which have upset the ability of cities to take service.

Despite the asserted losses in revenue from Mississippi, witnesses testified that the company had been able during the depression from its operations in all states, to pay a dividend of 8 per cent on stock, as well as to meet maturing obligations.

George J. Yundt, vice-president and treasurer, explained that the dividends were paid out of a surplus, which had been accumulated over a period of years, and that dividends in some years had not been paid.

Mr. Yundt explained that the stock of the Southern Bell was owned largely by the American Telephone & Telegraph Co., and that, in his opinion, the company should be allowed to earn 8 per cent on its investment. He said the fact that his company had "fared better than any other business, during the depression, was due to good business management."

Robert Goodman, general commercial supervisor, said that he did not hold to the theory that reduced rates would encourage resumption of service by patrons who dropped out because of abnormal economic conditions.

The last witness was F. L. Woodruff, assistant to President Ben S. Read. He said that outstanding bonds of the company were less than one-third of the value of the property. Previously, Mr. Yundt had shown that the company owes $190,000,000, which was figured at more than 90 per cent of the ledger value of the propertics.

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Michigan Bell Denied Increase in Rates

The Michigan Bell Telephone Co.'s petition for an increase in rates was denied Monday, January 14, by the Michigan Public Utilities Commission. Three democratic members signed the order, while two republicans refused to participate on the ground they knew nothing of the contents of the 145-page document.

The action of a majority of the commission marked another step in the telephone rate case which has been dragging for years. James B. Balch, democratic chairman, announced further hearings, starting January 22, to determine whether rates should not be substantially reduced.

Commissioners Robert H. Dunn and Harold J. Waples declined to sign the order because they said it had been presented to them with only one day's notice by the chairman. They plan to study the order and the briefs filed by the company, after which they will write an opinion.

"According to the company's methods, rates would be increased in times of depression because customers have fallen away," Chairman Balch said. "Our opinion holds it is unsound economically and legally to boost rates so revenue would be the same as if the company had a full capacity of subscribers. We hold the company's claim for a 7 per cent rate of return is far out of line with what is proper today.

"We mean business and, in our opinion, have given expression to fundamental principles which will enable the commission, mindful of its sworn duties, to establish rates reasonable to the public. These principles have application to other utilities as well, especially the power companies."

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Reorganization Plans Conditionally Approved

The Nebraska State Railway Commission has given conditional approval to the reorganization plans of the Central West Public Service Co., with Commissioner F. L. Bollen dissenting. The company operates a number of public service plants, including telephone companies in various states, having properties at Columbus and Albion, Neb.

The company is incorporated in Delaware, but operates through a number of subsidiaries. Recently the parent company applied to the federal courts of New Jersey for a corporate reorganization under the amendments to the national bankruptcy act.

The Central West company of Nebraska is one of the subsidiaries, but its bonds and common stock are all held by the parent company, which has pledged them as collateral for its own bonds. The reorganization contemplates segregating into a separate corporation all of the non-profitable corporations. The profitable companies will be consolidated under the management of a new company for which a proposed capital structure is set up and which will issue bonds.

The securities and stock of the new company will be exchanged for the present securities of the bondholder, certain proportion of the bonds, preferred and common stock being exchanged for each $1,000 of the old bonds. This results in a considerable write-down of the assets of the company. The federal court, however, had made it a condition of its approval that the proposal be approved also by the commissions of all of the states in which it operates.

The attorney-general advised the commission that it issue no order authorizing refunding of the obligations of the operating company in Nebraska. He pointed out that the application was not

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Capacities: ¾, 1½, 3 and 6 ton.

Weights: 14, 25, 34, 65 lbs.

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Danville, Ill.
Tel. Main 491

made by the local corporation, but by the holding company. He said that while the debtor itself is not subject to regulation by the commission, any subsidiary or operating company is, so far as the issuance of refunding securities is concerned.

Under the circumstances the common stock and bonds, having been issued to and having become the property of the holding company, it would appear, he said, that the two corporations have acquired a very close, identical existence. The legal fiction will not prevent necessary supervisory control. The Nebraska corporation became no more than the agent of the holding company in carrying out the common corporate purposes of both, and may properly be regarded as its agent.

The attorney-general says that all the legal presumptions favor the jurisdiction of each state to act as the best interests of its people dictate, and as the act of Congress includes as an essential part of all reorganization plans that the regulatory bodies of the states interested must have an opportunity to pass on the plans, he felt the commission had full authority to act.

At the hearing it was objected that the proposed reorganization would result in a debt burden of over three million dollars, being made a lien against the Nebraska properties instead of the separate and distinct lien created by the bonds issued by the Nebraska subsidiary, since there will be no subsidiaries hereafter.

The attorney general suggested that the commission require that the Nebraska subsidiary be retained and its obligations scaled down pro rata upon the property of other profitable companies.

The order issued makes the condition that the liability of the Nebraska property of the company, on the new issues proposed, be restricted. Commissioner Bollen thought that the proposal itself should make it clear that no unfair share of the obligations of the company in the other eight states in which it operates be saddled upon the Nebraska property.

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Summation Report Filed in Baltimore, Md., Case

A summation of the 2,638 pages of testimony taken in the case in which the Maryland Public Service Commission is seeking to impose a $1,000,000 rate cut on the Chesapeake & Potomac Telephone Co. was filed January 4 in the office of the clerk of the United States District Court. It was necessary that this record and other papers in the case be filed by the clerk by January 15 with the United States Supreme Court.

The Maryland commission has appealed to the court from the decision of the three-judge court which last summer granted the telephone company an injunction restrainnig the commission from enforcing its rate-cut order.

Before filing the summation, attorneys for both sides met with Federal Judge W. Calvin Chesnut, and stipulated that the summation and the exhibits were satisfactory both to the commission and to the company.

Judge Chesnut was a member of the court which tried the case on appeal from the commission's ruling. The others were Judge Morris A. Soper, of the United States Circuit Court of Appeals for the Fourth Circuit, and Judge William C. Coleman, the other federal judge in Baltimore.

The opinion of the court in the rate case was to the effect that the commission's ruling was confiscatory, as the amount of the cut would prevent the company from earning a fair return on its investment.

The company was represented by R. A. Van Orsdal, Charles McHenry Howard and Raymond S. Williams.

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Ohio Bell Company Files Reply Brief

A decision handed down January 7 by the United States Supreme Court in the West Ohio Gas Co. case is cited in a brief filed in the Ohio Supreme Court by the Ohio Bell Telephone Co. as supporting its contention that the valuation and rates established by the public utilities commission in the state-wide telephone rate case should be set aside.

The telephone company, in its brief, calls attention to the action of the United States Supreme Court in reversing a decision of the state supreme court which approved lower rates fixed for consumers of the West Ohio Gas Co. at Lima, Ohio, in which case the utilities commission had reduced gas rates fixed by city ordinance and ordered refunds of alleged excess earnings.

The document just filed is a reply brief of the Ohio Bell in its appeal to the Ohio Supreme Court from rulings of the utilities commission, particularly the order directing the company to refund $11,832,264 to its subscribers in a number of cities and towns throughout the state.

The company takes the position that the decision in the West Ohio Gas Co. case rejects identical contentions made by the utilities commission in support of an order like the one in the telephone case in many respects. The brief is concluded with a request to the Ohio Supreme Court, urging that it not only reverse the commission's valuation, refund and rate orders, but also to instruct the commission with respect to the errors in its findings, in order to prevent "further protracted proceedings" before the rate-making body that would otherwise be "almost inevitable."

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Commission Rulings and Schedule of Hearings

FEDERAL COMMUNICATIONS COMMISSION, Washington, D. C.
(Telephone Division)

January 17: Decided that the Du Bois (Neb.) Telephone Co. and the Fort Kent (Me.) Telephone Co. are subject to the jurisdiction of the commission.

It was also decided to require all telephone companies subject to the commission's jurisdiction to file duplicate copies of their schedule of charges submitted to commission in response to order No. 1 of the telephone division.

FEDERAL COMMUNICATIONS COMMISSION, Washington, D. C.

February 4-5: Hearing on the applications of 11 individuals to hold positions as directors or officers of more than one carrier subject to the commission's jurisdiction. Included in the list of those to appear are Sosthenes Behn of International Telephone & Telegraph Co., Walter S. Gifford of American Telephone & Telegraph Co., David Sarnoff of Radio Corporation of America, and others. The hearing was postponed to these dates from January 21.

ILLINOIS

January 22. Hearing in Springfield on application of the Illinois Bell Telephone Co. for consent to and approval of the purchase of certain telephone properties in St. Clair county from the Southwestern Bell Telephone Co.

MICHIGAN

January 14: In a three to two decision, the commission reaffirmed its opinion that the Michigan Bell Telephone Co. is not entitled to a rate increase amounting to about $3,000,000 a year.

January 22: Hearing on a petition to reduce the rates of the Michigan Bell Telephone Co.

MISSISSIPPI

February 5: Continued hearing, adjourned to this date from January 18, in the commission's investigation of the rates of the Southern Bell Telephone & Telegraph Co.

NEBRASKA

January 15: In the matter of the application of the Martell Telephone Co. for authority to continue in force during 1935 the present emergency rate schedule; found reasonable, and order granted as requested.

January 16: In the matter of the application of the Central Nebraska Telephone Co. for authority to put into effect for the remainder of the year reduced rates for farm service at its exchanges at Maxwell and Brady; found reasonable and granted as requested.

NEW YORK

January 24: Resumed hearing in the commission's investigation into the rates of the New York Telephone Co. Following a session before Commissioner Neal Brewster on January 10, the case was continued to January 24 and 25 and 30 and 31.

At the January 10 hearing only one witness was heard, Clarence M. Ostergren, an engineer for the company, who was cross-examined by Colonel William G. Blakeslee, counsel to the commission. Mr. Ostergren has presented testimony concerning the method of computing de-

(*Please turn to page* 34.)

The differential polar telegraph also requires an accurate balancing of line capacity and resistance; otherwise the outgoing currents would not balance in the two windings of the differential relay and the relay would operate from signals from its own station.

The Half Duplex

Polar duplex equipment does not permit "break-in" service unless the apparatus is operated on what is known as a "half-duplex basis." This requires a pole-changing relay, which is provided with a holding coil, and a separate relay which is referred to as a "control" relay connected as shown in Fig. 12.

Using this additional equipment, "break-in" service can be provided over a polar duplex system but it is, of course, necessary to sacrifice the two-way simultaneous transmission features of duplex systems. The half-duplex telegraph arrangement may be used either as a terminal unit or as an intermediate telegraph repeater.

The half-duplex arrangement offers certain advantages over the simple repeater in that it permits operation over lines having relative poor insulation.

Figure 12 shows the circuit of one terminal of a half-duplex polar telegraph circuit. It will be seen that the pole-changing relay is provided with a holding coil *H*, and

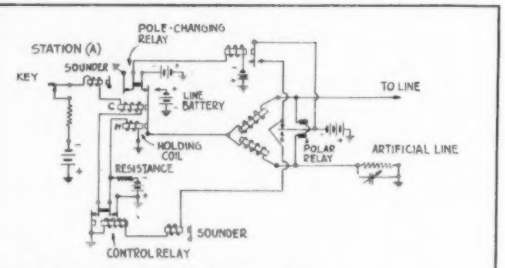

FIG. 12. HALF DUPLEX TELEGRAPH CIRCUIT.

that this relay is operated through the contacts of control relay *C*. "Break in" operation by another station operator on the line is accomplished by the half-duplex system as follows:

If the distant station (not shown) opens its key the polar relay at station *A* causes the control relay to fall back. The control relay thus removes the shunt around the holding coil, causing it to operate, holding the pole-changing relay in the operated position but removing the ground from the operating winding of this relay.

If the telegraph operator located at station *A* tries to send, the local sounder will not operate, indicating that the key of the distant station is open.

Telephone Repeaters

The writer of these data sheets has received numerous letters during the past few years from telephone men asking for circuits of vacuum tube amplifiers suitable for amplifying telephone conversation. The impression seems to prevail that ordinary voice-frequency amplifiers, such as are used in radio and public address applications, should also be suitable for telephone use.

There is a difference between the use of an amplifying device in a telephone circuit and the use of one in connection with radio or public address apparatus. This distinctive difference results from the fact that an amplifier inserted in a telephone line *must be capable of handling voice-frequency currents passing in two directions*, while radio and public address amplifiers need be only one-way devices.

It was clearly recognized that some means of amplifying voice currents passing over long distance lines would be necessary if universal telephone service were to be given. One of the first telephone repeaters developed was known as the "Shreeve repeater." It was the invention of H. E. Shreeve of the Bell company. This repeater was used on a long distance line extending between Boston and Amesbury, Mass., in 1904.

The Shreeve repeater was subsequently improved and was used successfully on the first transcontinental circuit between New York and San Francisco. It served until the vacuum tube type of repeater was developed, after which the Shreeve repeaters were replaced with the vacuum tube type, due to the many advantages of the latter. Vacuum tube type repeaters were first used in transcontinental service about 1915.

The Shreeve Repeater

The amplifying element of the Shreeve repeater consisted of an electromagnetically-operated carbon microphone element shown schematically in Fig. 1. It will be seen that it consists essentially of an electromagnet having two windings: one winding (1-2) is the operating winding into which pass the voice currents to be amplified, while the second winding (3-4) is a magnetizing winding supplied with direct current from a local battery.

The microphone element, which is somewhat similar to the elements used in ordinary transmitters, is electromagnetically operated by the small iron core which moves in synchronism with the impressed electrical waves. Movement of the microphone element causes a variation in the direct cur-

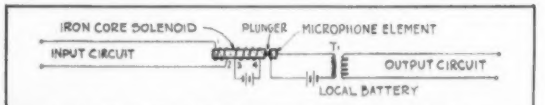

FIG. 1. SCHEMATIC OF THE SHREEVE REPEATER ELEMENT.

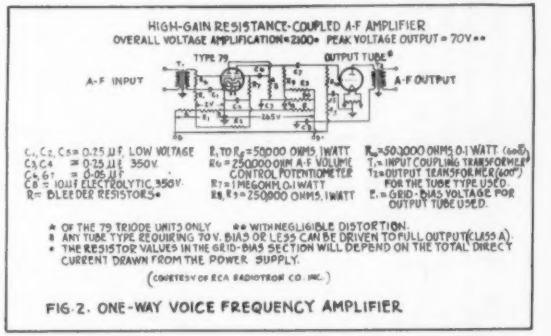
HIGH-GAIN RESISTANCE-COUPLED A-F AMPLIFIER
OVERALL VOLTAGE AMPLIFICATION = 2100* PEAK VOLTAGE OUTPUT = 70V**
TYPE 79
OUTPUT TUBE*
A-F INPUT
A-F OUTPUT
C1, C2, C5 = 0.25 μF, LOW VOLTAGE
C3, C4 = 0.25 μF, 350V.
C6, C7 = 0.05 μF
C8 = 10 μF ELECTROLYTIC, 350V.
R = BLEEDER RESISTORS+
R1 TO R5 = 50000 OHMS, 1 WATT
R6 = 250000 OHM A-F VOLUME CONTROL POTENTIOMETER
R7 = 1 MEGOHM, 0.1 WATT
R8, R9 = 250000 OHMS, 1 WATT
R10 = 50-30000 OHMS, 0.1 WATT (600Ω)
T1 = INPUT COUPLING TRANSFORMER
T2 = OUTPUT TRANSFORMER (600Ω) FOR THE TUBE TYPE USED
E1 = GRID-BIAS VOLTAGE FOR OUTPUT TUBE USED.
* OF THE 79 TRIODE UNITS ONLY. ** WITH NEGLIGIBLE DISTORTION.
§ ANY TUBE TYPE REQUIRING 70 V. BIAS OR LESS CAN BE DRIVEN TO FULL OUTPUT (CLASS A).
+ THE RESISTOR VALUES IN THE GRID-BIAS SECTION WILL DEPEND ON THE TOTAL DIRECT CURRENT DRAWN FROM THE POWER SUPPLY.
(COURTESY OF RCA RADIOTRON CO. INC.)

FIG. 2. ONE-WAY VOICE FREQUENCY AMPLIFIER

rent flowing in the primary winding of the transformer, T_1. This variation in primary current induces an amplified replica of the input voice currents on the secondary side of the transformer, and these pass on to the distant station.

The Shreeve repeater had several inherent disadvantages, such as considerable distortion, somewhat unstable and limited amplification. So far as the writer is aware, none of these repeaters is still in use.

One-Way Amplifier

The vacuum tube makes an ideal amplifying element and one having none of the inherent disadvantages of the early Shreeve repeater.

Almost unlimited amplification can be obtained with several vacuum tubes in cascade. In a properly-designed circuit the vacuum tube will introduce little if any distortion to the voice current which they amplify. The vacuum tube, like the Shreeve repeater element, is a one-way amplifying device. If connected in a telephone line, as shown in Fig. 2, it will amplify where a fairly high gain and medium power output one-way amplifier is required for occasional use. Such amplifiers as shown in Fig. 2 are often used in telephone lines for one-way amplification, in applications where programs are passed over telephone lines, where a large group of people are to listen in on a telephone conversation, for amplifying incoming voice currents for deaf persons, or for cable fault location tests.

The only problems inherent to the use of one-way amplifiers in telephone circuits is the matter of matching the input and output impedance of the amplifier to that of the line or telephone apparatus, and the maintenance of output and input power levels which will not disturb other adjacent circuits and yet which are sufficiently great to override line and circuit noise. The amplifier circuit of Fig. 2 is especially designed as an all-purpose amplifier for use in telephone plants.

Condensed Telephone News

Financial

COMFREY, MINN.—C. A. Englund, manager of the Comfrey Rural Telephone Co., has been associated with the company for the past 20 years. The company was organized in June, 1906, and now serves approximately 300 subscribers. Since its organization it has paid an average dividend of 6.86 per cent on the $9,300 of capital stock outstanding, the company's only liabilities. Its total assets are $30,900.

The report of Secretary C. B. Armstrong indicated that the company has weathered the depression remarkably well and that patrons who had their telephones removed are gradually ordering them put back into service.

Construction

TROY, OHIO.—The Troy Telephone Co. is completing the removal of overhead telephone lines in the eastern part of the city. The work will necessitate the removal of approximately 100 telephone poles. Plans are being completed for extending the underground wire system in the western part of the city within the next few months.

CHEYENNE, WYO. — The Mountain States Telephone & Telegraph Co. will spend $295,400 in its 1935 construction program in Wyoming, C. L. Titus, Wyoming manager for the company, has announced.

Of the total $68,500 will be spent for new construction and $226,900 for replacements.

Elections

GALESBURG, ILL.—At the annual stockholders' meeting of the Intra State Telephone Co., the present board of directors was reelected, consisting of A. R. Bone, O. N. Custer, L. D. Johnson, C. E. Marsh, Sidney Nirdlinger, R. G. Roadstrum, T. N. Swanson and F. C. Woods. P. J. Ramsey was elected to the board to fill a vacancy created by the death in the past year of E. R. Cogswell.

The directors' meeting followed that of stockholders, and the following officers were elected: President, Omer N. Custer; vice-president and general manager, F. C. Woods; treasurer, C. E. Marsh; assistant treasurer, L. D. Johnson; secretary and manager, R. G. Roadstrum; attorney, Wilfred Arnold.

The Intra State company had more subscribers at the end of 1934 than at the beginning, it was reported, since a gain in stations was made during the year. Reports gratifying to stockholders were presented at the meeting, which was well-attended.

Tampa, Kans.—At the annual meeting of the Farmers Mutual Switchboard Association the following officers were elected for 1935:

President, F. T. Pecinovsky; vice-president, Adam Kleiber; treasurer, L. V. Hungerford; secretary and manager, Ed. McIntosh; directors, H. F. K. Mueller, Anton Ottensmeier and William Stegeman. The operators are Delia Sweeney, Ruth Teetzen, Agnes Hackler and Mrs. Ed. McIntosh.

COMFREY, MINN.—Stockholders of the Comfrey Rural Telephone Co. held their annual meeting January 15 and reelected directors and officers for the ensuing year. E. F. Cullen, Gust Fredine and O. H. Anderson are the only directors who do not also serve as officers. The officers are as follows: C. F. Schweiger, president; George Rathman, vice-president; W. C. Schweiger, treasurer; C. B. Armstrong, secretary, and C. A. Englund, manager.

Miscellaneous

CHICAGO, ILL.—The Illinois Bell Telephone Co. during 1934 added approximately 25,000 additional telephones to its system in Chicago and about 5,400 in Illinois outside of Chicago. An additional 1,100 was installed for the state as a whole during the first half of this month.

Installations in Chicago on January 15 numbered 824,884 stations, as against 824,293 on December 31, 1934, and 799,112 on December 31, 1933. Outside of Chicago the telephones in service totaled 368,027 on January 15, as against 367,643 at the close of 1934 and 362,253 at the end of 1933.

Every month during 1934, with one exception, showed an increase in stations in service. July registered a loss of 236 units.

FIG. 1. SCHEMATIC OF THE SHREEVE REPEATER ELEMENT.

circuit noise. The amplifier circuit of Fig. 2 is especially designed as an all-purpose amplifier for use in telephone

the local sounder will not operate, indicating that the key of the distant station is open.

P&H PROCESS Poles
Field Tests Prove
their Long Life

P&H

"Still in the Lead"

PAGE AND HILL CO.
Minneapolis, Minn.

CEDAR IS THE NATURAL POLE WOOD

MAKING THE TELEPHONE
STILL MORE INDISPENSABLE
—*the Postal Telegraph Plan*

Independent telephone companies which have adopted the Postal Telegraph Plan have found

—that their subscribers appreciate the complete communications service . . . telephone, telegraph, cable and radio . . . available to them direct from the telephones in their homes and offices.

—that it makes the telephone a still more necessary adjunct to the daily conduct of business and social life.

—that it brings in additional revenue without additional capital investment.

Ask about the "Postal Telegraph Plan" today.

THE INTERNATIONAL SYSTEM

Postal Telegraph

Commercial Cables · All America Cables · Mackay Radio

The Manufacturers' Department

Death of Former Kellogg Sales Representative

Harry C. Goldrick, 57 years old, former Kellogg sales representative and well known in the telephone industry, died recently at his home in Los Angeles, Calif. Two years ago he underwent an abdominal operation and while not recovering his health, was able to engage in business until he suffered a paralytic stroke six weeks prior to his death.

Mr. Goldrick was born in Pennsylvania, the family moving to Indianapolis, Ind., when he was a child. His first employment was with the old Central Union Telephone Co. in Indianapolis. While he was wire chief for that company, he resigned to become a regional sales manager for the Kellogg Switchboard & Supply Co. Later he was a sales representative of the Graybar Electric Co. The widow and three sons survive.

• • •

Strowger R-C-X Ordered by Minnesota Company

Orders have been placed by the Inter County Telephone Co. with American Automatic Electric Sales Co. for a 100-line R-C-X (remote controlled exchange) for Hayfield, Minn., to serve approximately 200 telephones. This company, of which Ross Hollowell is vice-president and general manager, has its headquarters at Blooming Prairie, Minn. It owns and operates four exchanges in all, two of which are now to be operated with R-C-X equipment.

The first R-C-X installation made by this company was a 50-line unit for its exchange at Hollendale.

• • •

Harvester's Automotive Engineering Chief

In recognition of his conspicuous achievements as chief engineer in charge of motor truck engineering for the International Harvester Co. since 1927, A. W. Scarratt has just been advanced to the position of chief engineer in charge of all the company's automotive engineering activities.

Besides supervising engineering developments of motor trucks as heretofore, Mr. Scarratt will have charge of similar work on McCormick-Deering tractors and stationary and portable power plants.

From 1914 to 1926, Mr. Scarratt was prominently identified with tractor engineering work, holding the position of tractor engineer and later chief mechanical engineer for a well-known manufacturer. Prior to that, he was engaged in railway engineering work and just before joining the Harvester organization in 1927 was chief engineer for the Hyatt Roller Bearing Co.

Specially worthy of mention is the development under Mr. Scarratt's direction of the recently-announced streamlined International C trucks, consisting of nine new models from ½-ton to 5-ton size. These trucks are not only more attractive in appearance and more powerful, but also have more efficient braking and steering and many other improvements.

Since Mr. Scarratt became chief motor truck engineer, International Harvester has produced its ½-ton unit, now represented by the new C-1 truck, for which already an unusual demand has developed. Another model brought out in this period is the M-2, largest selling stand-up-and-drive milk-delivery vehicle in the country.

Mr. Scarratt has long been very active in the Society of Automotive Engineers, being for several years a member of the motor coach and motor truck committee and of the lubricants division committee.

W. D. Reese, who recently joined the International Harvester organization as Mr. Scarratt's assistant, succeeds him as chief engineer of motor truck engineering. Mr. Reese is well known in the motor truck engineering profession and has been prominently identified with the Society of Automotive Engineers, being at present a member of the society's truck rating committee and the rim committee.

After graduation from Lehigh University in 1916, Mr. Reese became a research engineer for the Remington Union Metallic Cartridge Co. From 1917 to 1919 he was in the research department of the Locomobile Co. In 1919 he joined the engineering staff of the Fifth Avenue Coach Co. and in 1922 became affiliated with the Yellow Truck & Coach Co., being chief engineer of the company's Yellow sleeve-valve engine works. From then on until he joined the Harvester organization, his time was spent on important phases of engineering development work.

• • •

New Bulletin Issued by Everstick Anchor

The Everstick Anchor Co., Fairfield, Iowa, has just issued bulletin No. 1134, which supersedes all previous issues. This new bulletin is very attractive with its large illustration of an Everstick anchor on the front cover, and its well-illustrated pages showing the complete line of Everstick anchors and other pole line specialties.

The fact that Everstick anchors are made of certified malleable iron is emphasized in this new bulletin. A statement for the introduction reads as follows:

"Certified malleable iron is well known by engineers for its great tensile strength and high elastic limit combined with exceptional toughness. This is the reason why the Everstick anchor stands the gaff under strain far beyond its rated holding power."

• • •

Burglar Proof Cabinet For Public Pay Stations

The Ohio Bell Telephone Co. has in use a new all-steel burglar-proof cabinet for public telephones. When the cabinet's steel door is closed and padlocked, the enclosed telephone is said to be absolutely inaccessible to petty thieves and night prowlers.

The cabinet is being manufactured and sold by a Cleveland, Ohio, steel equipment company for use in filling stations and other places where burglaries are common.

• • •

Recent Prices in the Metal Markets

NEW YORK, N. Y., January 21: Copper—Quiet; electrolytic spot and future, blue eagle, 9.00c per lb. Lead—Steady, spot New York, 3.70c per lb.; East St. Louis, 2.55c.

ELECTROX RECTIFIERS
For charging storage batteries in Telephone Service or operating P-B-X, P-A-X, C-A-X Systems without batteries.
Write for Circular 332.
Schauer Machine Co.
905 BROADWAY
CINCINNATI, OHIO

Telephone Directory
ADVERTISING
Write or telephone for proposition
L.M.BERRY & CO.
Call L.D.16 - Telephone Bldg., Dayton, O.

Buyer's Weekly Guide

A list of firms and companies offering equipment, supplies or services for operating telephone companies

ADDING MACHINES

Burroughs Adding Machine Company, Second Blvd., Detroit, Mich. — Adding, Bookkeeping, Calculating, Billing and Accounting Machines, Electric Carriage Typewriters, Standard Typewriters, Operator Correct-Posture Chairs. Burroughs machines are in use today in hundreds of progressive telephone companies throughout the country.

BATTERIES—DRY CELLS

Bond Electric Corporation, 257 Cornelison Ave., Jersey City, N. J.—Bond Telephone Dry Cells, Bond Flashlights and Batteries, Industrial Flashlights and Batteries, Bond Dry Batteries, Storage Batteries, Voltpruf Special Flashlights for linemen, Victor Telephone Cells and Bond Formula 1216 Inhibitor, ideal for keeping the cooling system of trucks and service cars free from rust, scale and corrosion.

National Carbon Company, 30 E. 42nd St., New York.—"Columbia" Telephone Dry Batteries; "Eveready" Flashlights, Flashlight Batteries and Long Life Dry Cells, "National Pyramid" brushes, carbon, graphite and metal graphite for motors, generators and rotary converters. "Eveready" Prestone anti-freeze; "Eveready" Rustone rust preventive; and "Eveready" Air Cell telephone operators' transmitter batteries.

Ray-O-Vac Company, Madison, Wis.—Ray-O-Vac telephone batteries — longer life and better service proven by tests in accordance with U. S. Government standards and records of users. Ray-O-Vac flashlights and industrial flashlight batteries are other items showing Ray-O-Vac's outstanding quality.

BATTERIES—STORAGE

The Electric Storage Battery Company, Allegheny Ave. and 19th St., Philadelphia, Pa.—Exide Storage Batteries. Branches: Boston, New York, Rochester, Philadelphia, Pittsburgh, Washington, Atlanta, Cincinnati, Cleveland, Detroit, Chicago, Kansas City, Minneapolis, St. Louis, Denver, San Francisco and Seattle.

BATTERY CHARGING EQUIPMENT

General Electric Company, Bridgeport, Conn.—Tungar battery chargers. G-E pole line hardware. Cable filling compound.

CABLE—LEAD ENCASED

British Insulated Cables, Ltd., Surrey House, Embankment, W. C. 2, Factory: Prescot, Lancashire, England.—Telephone cable of all sizes and capacities.

General Cable Corporation, 420 Lexington Ave., New York, N. Y.—Paper telephone cables of standardized manufacture for over forty years. Weatherproof and insulated copperweld drop wire.

Eugene F. Phillips Electrical Works, Ltd., Montreal, Can.—For any type of wire or cable used in telephone, telegraph or power work get in touch with "Phillips." Manufacturers of bare and insulated copper wires, rubber insulated wires, enameled wire, magnet wire, telephone cables, power cables, switchboard cables, flexible cords, copper rods, etc.

CABLE RINGS

National Telephone Supply Company, 5100 Superior Ave., Cleveland, Ohio.—National Cable Rings, National Splicing Sleeves, Non-Breakable Messenger Cable Hangers, Marlin and Swisher Cable Hangers and Custom Galvanizers. National cable rings are practical because they are two-way,—they allow the cable to be pulled in either direction. National sleeves make secure the weakest points in the line. If it's a splice—make it a National.

CABLE TERMINALS

Cook Electric Company, 2700 Southport Ave., Chicago, Ill.—Protective Pole Cable Terminals, Unprotected Pole Cable Terminals, central office protection, lightning arresters, sleeves, fuses.

Reliable Electric Company, 3145 Carroll Ave., Chicago, Ill.—A complete line of telephone and switchboard protectors and specialties. All sizes of cable grips.

CARBON DIAPHRAGMS

Noris Carbon Company, Inc., 160 5th Ave., New York, N. Y.—Carbon diaphragms, carbon back plates, granular and globular carbons, lightning arresters.

CONDUIT

Brazil Hollow Brick & Tile Company, Brazil, Ind.—Makers of Brazil Vitrified Tile. Conduit.

CORDS, CABLE AND WIRE

Lenz Electric Manufacturing Co., 1751 N. Western Ave., Chicago—Established 1904—telephone and switchboard cords for all makes of equipment, braided and lead-covered telephone cable, flame-proof jumper wire, interior telephone wire, switchboard wire.

CORDS AND WIRE

Runzel Cord & Wire Co., 4727-31 Montrose Ave., Chicago—Telephone and Switchboard Cords, Flame-proof Jumper Wire, Switchboard Wire, Interior Telephone Wire. W. L. Runzel, President, has devoted over 40 years to the making of fine telephone cords.

ELAPSED TIME RECORDERS

Calculagraph Company, 50 Church St., New York, N. Y.—Calculagraph is the world's standard elapsed time recorder and gives you toll records printed with elapsed time to the second. Both spring driven and electric motor models are available.

POLES

B. J. Carney & Co., 100 N. 7th St., Minneapolis, Minn.—Western red cedar poles. Pentrex Butt Treated or Plain.

Alfred E. Cowling, Scotstown, Quebec.—Eastern cedar poles, plain or butt treated.

MacGillis & Gibbs Company, Milwaukee, Wis.—Northern White and Western Red Cedar Poles. Plain or butt-treated. Immediate quotations on request.

Michigan Pole & Tie Company, Newberry and Grand Rapids, Mich. — "Poles with Character." Northern White and Western Red Cedar. Strategically located yards, Minneapolis, Minn., and Reed City (Lower Michigan), insure quick deliveries.

H. Sigalet & Company, Ltd., Lumby, B. C., Canada — Western Red Cedar Poles. Plain or Butt treated.

Valentine Clark Corporation, 2516 Doswell Ave., St. Paul, Minn.—Finished Cedar Poles. Plain or Butt treated.

SUPPLIES, SWITCHBOARDS AND INSTRUMENTS

Automatic Electric Company, 1033 W. Van Buren St., Chicago, Ill.—Public Automatic Dial Systems, Private Automatic Dial Systems, Telephones, relays, signalling and control equipment.

Automatic Electric Company, Ltd., Milton Road, Edge Lane, Liverpool, England.—Automatic Telephone Equipment.

Automatic Electric Sales Company, Ltd., 1027 W. Van Buren St., Chicago, Ill.—Public Automatic Dial Systems, Private Automatic Dial Systems, Manual Telephone Equipment, telephones, storage batteries, wire, cable, poles, etc.

Kellogg Switchboard & Supply Company, Adams & Aberdeen Sts., Chicago, Ill.—Engineers and designers, manufacturers and suppliers of complete equipment for telephone exchanges and communication systems. Manufacturers of "Master-built" Common Battery, Magneto and PBX Switchboards, "Masterphone" Telephone Instruments, and a complete line of telephone supplies, including bronze drop and interior wire.

North Electric Manufacturing Company, Galion, Ohio—Machine switching telephone systems. Automanual and Automatic. "All-Relay" Switching Apparatus (Dialless and Dial Control). Unattended Satellite Systems.

Siemens Brothers & Company, Ltd., Woolwich, England—Automatic and Manual Telephone Equipment.

Stromberg-Carlson Telephone Manufacturing Company, 100 Carlson Road, Rochester, N. Y. — Telephone apparatus of all kinds, switchboard cords, cable and general telephone supplies.

TOOLS

Crescent Tool Co., Jamestown, N. Y.—CRESTOLOY Pliers, Curved Needle Nose Pliers, Heavy Diagonal Cutting Pliers, Linemen's Side Cutting Pliers, End Cutting Nippers, Crescent Hack Saws.

TRANSMITTER REPAIRS

The Telephone Repair Shop, 1760 Lunt Ave., Chicago, Ill.—Transmitters completely rebuilt and arranged for either magneto or C. B. service. Transmitter fronts and backs refinished in black. Transmitter buttons cleaned and refilled. Receivers repaired; ringer coils and generator armatures rewound.

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Rates 10 cents per word payable in advance. Minimum charge $2.00 for 20 words or less.

A VALUABLE BOOK FOR TELEPHONE MEN

$2.50 buys this book which has been so arranged by its publishers that the busy telephone man can absorb an excellent and up-to-date collection of helpful information in a minimum amount of time.

"TELEPHONY Including Automatic Switching" is written by Arthur Bessey Smith, E. E., and is fully illustrated. Everyone in the telephone business should have an intimate knowledge of the theory and operation of automatic switching. The construction of every switch, relay and contactor in the whole range of automatic devices is clearly and simply presented.

Pocket size, bound in Leatherette, Gold Stamping, 500 pages, 265 illustrations and Wiring Diagrams. **Price $2.50.**

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RINGING MACHINES

Holtzer Cabot Type

Motor 110-volt, 60-cycle A. C. Generator 80 volts, 19-cycle A. C.

$45.00

Motor 115-volt D. C. Generator 80 volts, 19-cycle A. C.

$40.00

First-Class Condition.

Guaranteed.

BUCKEYE TELEPHONE AND SUPPLY CO.
COLUMBUS, OHIO

TELEPHONE REPAIR SHOP

Guaranteed Transmitter Service

Any quantity, one or one thousand.

Baked, black, velvet finish, New granular carbon. Workmanship, adjustments and tests made with the latest and most improved apparatus. 50c each less backs.

Full information on request.

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Selling practically new, late-type, push-in, folding-door telephone booths as low as $16.00 F.O.B. Chicago, in lots of 6. Single booth prices on request.

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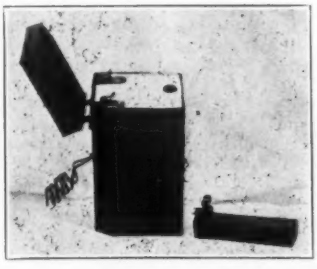
FOR SALE

FOR SALE — Magneto telephone exchange in California. 200 subscribers. Incorporated city on main California highway. Good agricultural district. Correspondence solicited. No trades. Box 8410, care of TELEPHONY.

New Ones from Old Ones

Don't throw away your defective transmitters; we guarantee to make them like new for only 50c. Give us a trial.

UNION ELECTRIC CO.
1165 E. 30TH ST.
INDIANAPOLIS, IND.



Locate cable trouble with the **CANTY FAULT FINDER.** This new cable tester operates on two dry cells and locates all cable faults (except opens). There are two binding posts for lead wires to bad cable pairs. Adjustment of tone is simple,—move lock nut up or down. Size 3"x4"x7". No telephone exchange should be without the **CANTY FAULT FINDER.** Price $12.50 postpaid complete, less head set. Address 8101, care of TELEPHONY.

COMMISSION AND COURT NEWS

(*Concluded from page* 32.)

preciation in central office equipment. His testimony was of a technical nature as Colonel Blakeslee inquired into the details of the estimates.

OHIO

February 14: Hearing on petition of the Johnston Citizens Telephone Co. for authority to sell its outside plant to the North Eastern Ohio Telephone Co. and to abandon its central office at Johnston in Trumbull county. The company, in its petition, pleaded that its operations are no longer self-sustaining.

PENNSYLVANIA

January 10: The commission informed the Bell Telephone Co. of Pennsylvania that it should have obtained the approval of that body to loans made from the American Telephone & Telegraph Co. The loans which the company made on and after July 1, 1933, from the parent company, amounting to $6,225,000, were said to be for current requirements. No penalty was announced by the commission for this action of the Bell company.

SOUTH CAROLINA

January 10: The commission authorized reductions in connection charges from $3.50 for all classes of service to $2.50 for business telephones and $2 for residence telephone in all South Carolina exchanges of the Coastal Telephone Co. and the Central Carolina Telephone Co.

The Coastal company serves Beaufort, Branchville, Hampton, Estill, Holly Hill and Ridgeland and the Central Carolina company serves Bethune, Chesterfield, Jefferson, McBee, Pageland and Ruby.

TENNESSEE

January 9: Rate reductions estimated at 10 to 12½ per cent by the Southern Continental Telephone Co. at Martin ordered by the commission.

The new monthly rates, effective February 1, follow: Business telephones: individual, $4; two-party, $3.50. Residence telephones: individual, $2.75; two-party, $2.25; four-party, $1.75.

WISCONSIN

January 5: Temporary reductions of rates by six telephone companies, which will save 1,679 customers $4,525, ordered extended by the commission, in some cases with the approval of the utility involved:

Northfield Farmers Telephone Co., Jackson county, $556 for 139 customers to January 1, 1936.

Town Sheboygan Falls Rural Telephone Co., $516 for 172 customers in year ending January 1, 1936.

Monduel Telephone Co., Shawano county, $1,547 for 516 customers in 1935.

Strum Telephone Co., Trempealeau county, $580 for 193 customers in year ending January 1, 1936.

Sullivan Telephone Co., Jefferson county, $575 for 320 customers in six months ending July 1.

Mauston Telephone Co., $750 for 339 customers in six months ending July 1, 1935.

January 17: Black Earth Telephone Co., of Black Earth, ordered to extend service to several parties in outlying territory. The company had refused to serve several parties because it would require erection of new lines or buying or renting lines from the Wisconsin Telephone Co. to which the parties were subscribers.